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CONTENTS

DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

John Sloane Anderson

FOR some months past it has been known that Mr. J. S. Anderson, Secretary and Treasurer of the London Passenger Transport Board, was seriously ill, and it was feared that he would be unable to resume work. It was, nevertheless, a shock to his wide circle of business friends to learn of his death last Friday at Mentone in the South of France at the age of only 48. John Sloane Anderson, who was born in 1888, was the son of Mr. Joseph Anderson of Wraysbury. He was educated at Radley and was admitted a solicitor in 1911. He became Assistant Solicitor to the Metropolitan Railway Company in 1914, but at the outbreak of war he enlisted as a private in the 18th Battalion of the Royal Fusiliers and was commissioned into the Queen's (Royal West Surrey) Regiment in 1915; later he was transferred to the Royal Flying Corps, and was promoted captain in 1918. During a night bombing expedition he was severely wounded at Savy in 1916. In 1929 Mr. Anderson succeeded Mr. I. Buchanan Pritchard as Chief Legal Adviser and Solicitor of the Metropolitan Railway Company, and in 1931 he became General Manager, discharging as well the duties of Chief Legal Adviser and Solicitor. On the formation of the London Passenger Transport Board in 1933 Mr. Anderson was appointed Secretary, Treasurer, and Solicitor to the board, the offices he retained until his death. As Secretary he was the only statutory officer of the board, for section 2, sub-section 6, of the Act of April 13, 1933, which formed the L.P.T.B., specified that "the board shall appoint a secretary and such other officers and servants as the board may determine."

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Beating the Quota

The results of the L.M.S.R. Quota League competition for 1936, published in *Quota News* this month, show that the efforts of the Commercial Department have been rewarded by an actual advance upon the volume of traffic aimed at for the year. Goods results in England and Wales attained to 102·12 per cent. of the quota, and passenger figures to 102·03 per cent. In 1935, both these classes of traffic fell slightly behind the objective, reaching 96·94 per cent. and 99·25 per cent. respectively. The Northern Division sent its goods traffic up to 106·31 per cent. of quota for the year, which brought it to 89·47 per cent. of the pre-depression standard which is the Commercial Department's goal. Northern Division passenger traffic reached 103·68 per cent. of the annual requirement, and 92·38 per cent. of the ultimate objective. There have been some close finishes in all competitions, Leicester, the champion in the English and Welsh Passenger League, beating Birmingham, the runner-up, by only 0·02 per cent. Wales heads the goods competition, but with a lead of only 1·03 per cent. over Northampton. In Scotland, Glasgow leads in both passenger and freight results, with 107·08 per cent. and 109·23 per cent. of quota respectively. The coal leagues are headed in England by Leeds (104·55 per cent.), and in Scotland by Edinburgh (102·10 per cent.).

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The Week's Traffics

Coal and passenger train traffics are the chief features of the returns for the past week of the four main-line railways. The general merchandise receipts compare with good takes for the corresponding week in 1936. For the past week the total increase is £106,000, comparing with an increase of £74,000 in the previous week. Aggregate receipts of the four companies to date amount to £27,946,000, an increase of £509,000 or 1·86 per cent. Passenger train traffics for the ten weeks show an advance of £272,000, general merchandise receipts a net advance of £236,500, and coal earnings a net advance of £500. The Southern, although recording a passenger train increase of £90,000, is not benefiting from the increased prosperity of the heavy industries.

	10th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	+ 19,000	− 5,000	+ 29,000	+ 43,000	+ 261,000	+ 2·33
L.N.E.R. ..	+ 12,000	+ 6,000	+ 23,000	+ 41,000	+ 104,000	+ 1·25
G.W.R. ..	+ 3,000	—	+ 17,000	+ 20,000	+ 115,000	+ 2·53
S.R.	+ 4,000	− 3,000	+ 1,000	+ 2,000	+ 29.000	+ 0·86

Both the Great Northern Railway (Ireland) and the Great Southern Railways show decreases for the past week.

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Elihu Thomson

By the death of this famous electrical engineer, the living representation of the middle initial of that even better-known combination, B.T.-H., has been removed from our midst. British-born, Thomson emigrated to the States at an early age, but many of his 700-odd electrical inventions and patents came back to benefit his native country. In the late 'seventies and early 'eighties his association with Dr. Houston, a professor of natural philosophy, proved extremely fruitful, and in 1882 the Thomson-Houston Company was floated for the exploitation of their joint patents. Ten years later the original Thomson-Houston concern was combined with the Edison General Electric Company to form the (American) General Electric Company, but the French and British Thomson-

Houston Companies remained as separate concerns, although there has always been financial interest and close technical collaboration, and the early patent rights extended to such associates of the G.E. as the Allgemeine Electricitäts Gesellschaft (A.E.G.). All the Thomson-Houston companies and their successors were associated with early railway electrification developments, including the N.E.R. Tyneside lines and the first Paris-Orleans conversion. Thomson himself was the inventor of the repulsion motor, which was developed for a.c. traction work into the Latour-Winter-Eichberg type, but one of the most useful of his inventions was the electric welding of metals by the resistance method, patents for which were granted to him as early as 1886.

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Southport & Cheshire Lines Extension Railway

This railway of 14 miles from the Cheshire Lines station at Aintree to Lord Street station, Southport, was opened for passenger traffic on September 1, 1884, and for goods traffic with Southport station on June 1, 1885. Though a separate undertaking it has always been worked by the Cheshire Lines Committee, which retains for working expenses 60 per cent. of the gross receipts up to £20 per mile per week and 55 per cent. above that figure, subject to a minimum of £6,000 a year secured to the Extension Company. It connects with the former Lancashire & Yorkshire Railway at a point just north of Aintree and again at Hillhouse. For 1935 Account No. 9 showed "gross receipts, after adjustment (including balance of guaranteed amount of traffic by the Lancashire & Yorkshire Railway Company for the year ended June 30, 1935)," and on the expenditure side "to Cheshire Lines Committee, percentage of gross receipts under working agreement," but in Account No. 9 for 1936 the entry is "proportion of receipts under working agreement, after adjustment" £8,087, and the balance carried to net revenue account is £7,469, as compared with £7,402 in 1935. This balance, together with £1,557 brought in, covers debenture interest and enables 2 per cent. for the year to be paid on the £75,000 of 2½ per cent. preference stock, leaving £1,694 to be carried forward. A 2 per cent preference dividend has been regularly paid for each year from 1921 to 1936 inclusive, but the ordinary stock of £288,000 has never received a return. Half-yearly reports were discontinued after 1922.

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"On Time" at Southport

Southport, no less than Blackpool, has its traffic handling problems, and the achievement of the L.M.S.R. Central Division in winning the "Byrom Cup" for express working in 1935 is all the more commendable considering these two centres of congestion in its area. A recent article in *On Time* pointed out that there are sixteen stations within the borough limits of Southport, of which twelve belong to the L.M.S.R. As well as its extensive pleasure traffic, Southport is a popular dormitory for business men working in Liverpool, Manchester, and most of the important towns in Central and East Lancashire. The principal station in the town is Chapel Street, where from June to September last year 1,463,307 tickets were collected; on a summer Saturday 475 regular trains inward and outward are here dealt with, but special occasions may call for the handling of some 40 arriving and departing specials. Traffic is complicated by the fact that at busy periods some of the rolling stock has to be stabled as far away as at Lostock Hall (19½ miles). Chapel Street is well equipped with respect to signalling, the terminal working being controlled by two electro-pneumatic boxes, the former with 82 and the latter with 105 levers (including spares).

Moving Day

March 25 is a familiar date in the world of removals, in view of the large number of tenancy agreements that expire at the end of the first quarter of the year. The British railways during the last few years have made rapid strides in the development of household, farm, and works removal services, with the result that the main-line companies now operate the largest household removal organisation in this country, and therefore are arranging to undertake an extra large number of household removals next week. By the introduction of mobile road-rail units or containers, specially constructed to carry furniture, a service is now available which covers packing and unpacking, and, by arrangement, the laying of linoleum and carpets, the hanging of pictures, and other incidentals. In addition, this railway organisation allows a 33⅓ per cent. reduction in fares, either third class or first class, to all members of the household to their new destination. Furniture and household goods in small or large quantities are included in this railway domestic removal service, and the insurance of furniture and effects is arranged where desired at low premiums. As a result of this organisation, household removals by railway have more than trebled in the past three years; in one instance furniture insured for £50,000 has been safely moved; the household effects of a peer were removed from South Wales to Wiltshire; and a coastguard's removal was accomplished from the Scilly Isles to the Isle of Skye.

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A Relic of Early South Wales Rail Transport

Chance has recently brought to light a fine example of mineral transport by plateway as used extensively a century and a quarter ago in South Wales. In December last workmen at Beynon colliery, Blaina, entered some old workings formerly connected with the Globe pit, which was closed down in 1876. Here they found a loaded coal tram of the type used in early years for transporting iron ore in the district; it is believed that, with the spread of the modern railway, these vehicles and their plate rails were transferred to the coal pits. This wagon, with its flangeless wheels, and four of the original plates, have been brought to the surface intact, and on page 538 we reproduce a photograph of the assembly. The Beynon colliery is owned by Richard Thomas & Co. Ltd., of Ebbw Vale, and this firm generously offered to present the relics to the National Museum of Wales. The council of that institution, at a meeting presided over by Sir Illtyd Thomas, gratefully accepted the offer, and so this interesting survival of a past era of mineral rail transport is happily being preserved in a public collection.

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"Voie Impaire" and "Voie Paire"

The expressions "up line" and "down line" appear to have been adopted practically from the beginning of public railways in this country and have received equivalent translations in some others, such as the Dutch expressions *Opgaand Spoor, Afkommend Spoor*. In France the terms "odd line" (*Voie Impaire*) and "even line" (*Voie Paire*) were early adopted and remain in use today, the *impaire* direction being defined as that in which the kilometres are numbered, in other words, the direction from Paris for lines serving that city. On plans and diagrams the two directions are frequently marked *Voie* 1, *Voie* 2, with supplementary designations where required, as for example on the parallel lines outside Paris on the Est, where one sees the names *Voie* 1 *bis*, *Voie* 2 *ter*, and so on; or on the P.L.M., where the terms *Voie* 1 *Rapides*, *Voie* 2 *Marchandises*, *Voie* 1 *Machines*, &c.; are employed.

The Nord adopted the expressions *Voie de Gauche* (left-hand line) and *Voie de Droite* (right-hand line), abbreviated to *V.G.* and *V.D.* on diagrams; the *Voie de Gauche* is the left-hand line seen by a person looking from Paris, again in the direction the kilometres are reckoned. Special designations are, of course, used where necessary, as outside the Gare du Nord, where one finds *Départ Chantilly, Départ Soissons, Retour Pontoise,* and so forth, supplemented by such terms as *banlieue* (suburban), *locaux* (local trains), *directs* (fast trains), *matériels* (empty stock), and so on. The terms *montante* (up) and *descendante* (down) are known in France, but not applied in the same sense on all the lines. Thus *montante* means from Paris on the Est, but towards it on the Etat.

* * * *

High Speed West of Chicago

Early in January last extensive accelerations were carried out by the American Santa Fé Company of the long-distance trains on the Chicago—Pacific Coast service. Chief among them is the retiming of the westbound Fast Mail, which carries only coach passengers and no Pullman cars. This train now covers the 2,930 miles from Chicago to Los Angeles, including all stops and the transit of the Rockies, in 48 hr. 50 min.; excluding stops the speed works out at 47·8 m.p.h. Included in the schedule are consecutive runs of 120·2 miles from Hutchinson to Dodge City in 120 min., and over the 101·2 miles from there to Syracuse in 100 min.; indeed, the running time over the entire 540·1 miles from Kansas City to La Junta is only 562 min., entailing a throughout average of 57·6 m.p.h. Later in the journey there is a booking of 125 min. over the 128·2 miles from Gallup to Winslow. The Chief—a heavy sleeping car express and, until the advent of the diesel-electric-hauled Super-Chief, the crack train over this route—has also been expedited and given a running average of 54·9 m.p.h. over the 540·1 miles from Kansas City to La Junta westbound, and 55·8 m.p.h. eastbound. The principal lines west of Chicago are all introducing runs timed at 55 m.p.h. and over into their timetables with their heavy steam-hauled trains, thus showing that, so far from the improvements being confined to the new flying diesel-electric services, the train service improvements affect all classes of long-distance train.

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Improvements at Frankfort Station

The Central station of the Reichsbahn at Frankfort-on-Main is one of the most imposing in Germany, and deals with a heavy and important traffic. The layout of the space in front of it, from which some half-dozen streets radiate, has of late years been found not to answer to the changed traffic conditions, or afford the degree of convenience expected by the public. In the summer of 1934, therefore, some alterations were put in hand to meet complaints. The flower beds and shrubs on each side of the booking hall, the main entrance to which projects a short distance beyond the other parts of the building, were removed to make car parks, and cab traffic to the centre portion was transferred to the sides. The front was thus left free for pedestrian traffic to and from the tramways, the island refuge along which was correspondingiy extended. As motorcars could no longer stop under the verandah roofing outside the central portion of the station, it was necessary to provide an equivalent at the sides, and two concrete shelters, 34 m. (112 ft.) long and 7 m. (23 ft.) wide, supported on central pillars, with newspaper kiosks at their outer ends, have been erected extending from each side of the booking hall to the tramways, these afford protection in bad weather to those waiting for trams as well as to cab passengers. The rent from the kiosks is sufficient to pay half the interest on the cost of the work. It was feared that the shelters would spoil the appearance of the station, but this has not been found to be so, and the additional convenience is much appreciated.

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A World's Record in Rail Length

The outstanding feature of the article which appears on page 539 of this issue describing the manufacture and laying of what are believed to be the first 120 ft. rails ever produced direct from a rail mill, is the facility with which this by no means easy job was carried through. Neither in the handling of the rails at the steelworks, nor in their transport, unloading on site, or laying in was there a single hitch of any description, and not the least remarkable record was that the rails, notwithstanding the unprecedented problems that these operations presented, were actually being run over at speeds up to 90 m.p.h. four weeks after the day on which they were rolled. Credit is due equally to the manufacturers and to the engineering staff of the L.N.E.R. Southern Area for the thoroughness with which every detail of the handling had been thought out and prepared for; the result of their work has been to prove that practically the only limiting factor in the production of rails of such a length is the possibility of moving them at the rail-mill from one machine to another to conduct the various finishing processes without fouling fixed structures, such as uprights of overhead craneways, buildings, and so on. It is of interest that the L.M.S.R. is now also to experiment with 120 ft. rails by laying in over a mile of rails of this length, to be produced by the same manufacturers, in the down main line near Hemel Hempsted.

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Has the Locomotive Advanced?

In the address which he gave at a recent meeting of the New England Railway Club, Colonel J. T. Loree, Vice-President and General Manager of the Delaware & Hudson Railway, indulged in some pungent criticisms regarding the evolution of knowledge on various vital matters concerning railway operation. The application of basic principles in the working of parts was, the speaker said, worked out by Watt and Bolton, Trevithick and Stephenson, over a hundred years ago, and the only certain addition to our knowledge is that while they found out how steam could be adapted to the propulsion of locomotives, their successors have gone on achieving the same end in the same way ever since. The early engineers worked under great handicaps both in the lack of precision tools and of any great metallurgical knowledge, but in spite of the great advance in both these fields, it is not really known today under what steam pressure and temperature it is most efficient to operate an engine—or so Colonel Loree said. The wheels of locomotives are firmly fixed to the axles, which turn in boxes serving to support and distribute the engine weight through springs. Though the attempt was made over a hundred years ago to turn the wheel on a fixed axle, with the addition of the principle of the roller bearing—an attempt which failed owing to the aforementioned condition of the metallurgical and toolmakers' arts—it is still customary to turn both axle and wheel as a unit, and when roller bearings are used, the axle for some still unknown though suspected reason breaks at the race way. Today power is still being wasted through back pressure in the cylinders, used to create increased draft in the engine; but Colonel Loree's statement that we are still in ignorance as to a method of regulating the exhaust to work the fire properly under varying conditions surely needs qualification in view of recent French developments.

The Plutocratic Excursionist

THE long-distance excursion passenger on the railway may be excused if, nowadays, he thinks more of himself than ever before. Accustomed, in times gone by, to being cooped up in trains which, viewed from the modern standpoint, offered few if any amenities, he had to be content with low average speeds and other inconveniences which served to remind him throughout the length of his journey that he was travelling on the cheap. Now, by comparison, he is accorded princely treatment, the ingenuity of the rolling stock designer and skill of the craftsman combining to provide him with everything that conforms to modern standards of comfort at their best. The seat on which he spreads himself is planned on anatomical lines and covered with tastefully coloured upholstery, whilst cunningly devised rests are provided, not only for his arms but for the swelled head which, in the circumstances, is not unnaturally his. The provision of tables between the seats meets one of his most defined wants, for who can enjoy a bottle of beer or other liquid refreshment, or conveniently play a hand of cards without a table?

Recent additions to what can only be termed luxury excursion trains are those now building at the L.M.S.R. Derby works, of which an illustrated description appears on pages 543-5 of the present issue. In these the comfort and convenience of the excursionist have been studied from every angle, and the interior appointments, general style, and finish of the vehicles leave nothing with which even the most captious critic can find fault. The adoption of the articulated principle of construction in these trains, combined with the free use made of high tensile steel and welding, have, in combination with another important feature, namely, that of fashioning the body integrally with the underframe, afforded marked economies in weight and overall length of the trains, a point specifically referred to and supported by actual figures in our article. Not only the railway company, but everyone concerned with the design and construction of the new stock are to be congratulated on the results of their efforts, as also, and in full measure are those who will make use of the vehicles and in so doing enjoy rapid travel in luxury at reduced fares.

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Railway Facilities for the Coronation

COMPREHENSIVE plans have been prepared by the British railways for facilitating journeys to London early in May for the Coronation festivities. For overseas visitors special express boat trains will be run from all the principal ports of disembarkation, in co-operation with the shipping companies, while railway-owned steamboat services will be largely augmented. In this connection the recent decision of the Government to reduce the consular visa payable by American tourists from £2 to 8s. as from April 1 should have an appreciable effect on the number of these visitors to the country. On Coronation Day, May 12, the companies have arranged to run over 200 long-distance excursion trains to London, and numerous connecting special trains on branch and subsidiary lines will link up with these, thus affording all principal towns a direct service to London. These long-distance trains will run mainly through the night so as to enable spectators of the Royal processions to reach their places along the route fairly early in the morning. The first trains will reach London shortly before midnight and will be followed by others in rapid succession until something like 100,000 passengers have been detrained by 6 or 7 a.m. Throughout the London suburban area, cheap Coronation Day tickets at approximately the single fare for the return journey, available by any train, will be issued by the main-line companies, and augmented services run. Coronation Day festivities are also being organised locally at many of the important towns and cities throughout the country, with decorations and illuminations, and cheap fares with considerably increased train services will be available for passengers from the surrounding country who desire to visit these centres.

London, however, will be the main centre of attraction, and for the many thousands of people who will desire to see the decorations and illuminations before or after Coronation Day, a very extensive programme of day, half-day and evening trips has been arranged by the main-line companies, by special or ordinary trains at very attractive fares, daily from Saturday, May 8 to Saturday, May 22 inclusive. As the general Whitsuntide holiday, during which the railway companies convey many thousands of people from the industrial areas to the country and seaside, falls at the end of Coronation Week, their operating resources will obviously be heavily taxed. Their arrangements could be considerably facilitated by advance applications for tickets, seats, restaurant car and sleeping berth reservations, &c., and in their own interests passengers are being urged to co-operate with the companies in this respect. Apart from the attraction of the Coronation festivities, many interesting travel facilities such as land cruises, tours, &c., will be available for Overseas visitors, while extensive programmes of Coronation tours have been prepared to enable them to make trips at very reasonable cost to such places of historic and scenic interest as Canterbury, the Shakespeare country, Windsor, Bath, Oxford, Cambridge, the Lake District, York, North Wales, Scotland and Ireland, at very reasonable cost.

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Railway Travel Facilities for Sport

THE British main line railways have not been slow to cater for the national interest in sport by the provision of cheap travel facilities for players and spectators. Railway travel facilities for sportsmen naturally cover a wide range, extending from the conveyance of thousands of spectators to an important football match at very low rates, to the issue of cheap fares for individual anglers. Football undoubtedly takes pride of place as a national sport from the point of view of numbers of spectators, and during the autumn and winter months cheap half-day bookings are given by many ordinary or special trains on Saturdays, and for all important mid-week matches. These fares are on an extremely low basis, ranging from about two-thirds to one-third of a penny a mile, third class. For participants in sports of all kinds, the railways have an arrangement under which they issue day tickets in bulk to the secretaries of clubs for the use of members and their families travelling to and from the club grounds and sports premises; these are issued at the single fare for the return journey, equivalent to three farthings a mile third class, and 1½d. a mile first class, subject to a minimum of two hundred such tickets being issued during twelve months. Tickets are issued at similar rates to parties of four or more members and officials of sports teams travelling together for the purpose of taking part in matches, exhibitions or competitions, and also to members of the public travelling in parties of not less than eight adults (two children under fourteen years counting as one adult), while special fares are also offered for sports parties travelling out one day and returning the next, or making circular tours.

For anglers, ramblers, and parties of not less than thirty adults travelling together between the same points, day tickets can be obtained by prior arrangement on the

basis of 1⅔ to 2½ miles a penny, third class, the charge a mile decreasing as the length of the journey increases. A further advantage is that organisers of parties under the three latter arrangements are allowed one free ticket for the first 25 fare-paying passengers, and additional free tickets according to the size of the party. For individual anglers, day tickets at single fare for the return journey are issued on production of approved credentials, while walking and cycling tourists, campers, &c., may by prior arrangement travel at two-thirds of the appropriate single fare from point to point. Incidentally, while hikers' mystery trips have been tried out successfully in this country, the number of cyclists to be seen in most of our cities and large towns prompts the suggestion that cyclists' trips might also be tried out on somewhat similar lines, the road itinerary being supplied to the cyclists upon arrival at the point of detraining. The conveyance of a large number of cycles would present some difficulty, but this could doubtless be overcome, while a useful business could be secured in buffet luncheons and snack boxes. Extensive cheap fare arrangements also exist for children. Parties of eight or more juveniles under sixteen, travelling together for school day outings, treats, &c., are charged only half the single fare for the return journey, or ⅜d. penny a mile, third class, while those over that age are conveyed at ¾d. a mile. A further concession is that juvenile camping parties affiliated to recognised organisations may obtain tickets at similar rates available for periods up to three months, a very valuable facility for Boy Scouts, Boys' Brigade, Girl Guides, and similar bodies.

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The Bianchi Hydraulic Signalling System

THE recent death, recorded on another page in this issue, of Signor Bianchi, recalls the fact that though he was eminent in all branches of railway engineering, he was perhaps best known, at any rate in this country, for his part in the early development of power signalling, and as the inventor of the hydraulic system extensively used in Italy, and to a lesser extent elsewhere. The first interlocking installation in Italy was of a primitive ground detector type at Florence in 1865; it was based on the ideas of Vignier of the French Western Railway. The first real locking frame was, however, imported in 1874 from Saxby & Farmer, England, for use at Genoa, and others followed at intervals during the next few years. In 1880 Bianchi was appointed to take charge of signalling work in Italy, and three years later the increasing length of stations, and in particular crossing loops at single-line stations, led him to consider the use of a power signalling system. Conversant with its utility for cranes, lifts and capstans, he came to the conclusion that hydraulic power would prove most suitable, especially as it could easily be accumulated at small stations by hand pumping. Hydraulic signalling had previously been tried at Vienna, in 1873, by Schnabel and Henning of Bruchsal, Germany, but the idea was new to Italy and to most other countries.

In developing his ideas Bianchi turned to Giovanni Servettaz of Savona, the agent for Tannet-Walker & Co., crane engineers, who was already making signal fittings, and the result was the first 10-lever hydraulic power frame, with signal and point movements, which was installed at Abbiategrasso on the Italian Mediterranean Railway in 1886. This station was selected for trial as points 410 yd. from the station building had constantly to be operated to pass the heavy traffic of the Milan—Genoa line. After a year's working a committee was appointed to keep the installation under special observation for three months, during which time only one movement, out of a total of 7,032, was not correctly completed, and as a result the committee recommended the general use of hydraulic as opposed to mechanical apparatus. Other and larger installations soon followed, and whole sections of line were equipped; the largest single cabin frame was put in at Naples in 1903 and had 175 levers. A gold medal was awarded to the system at the Paris Exhibition in 1889.

It continued in favour in Italy until, in 1934, there were no fewer than 13,469 hydraulic levers at work there. Electric power signalling, which had been in use for ten years, had 5,679 levers at that time, whereas the old Saxby mechanical type saw its peak year in 1925, when there were 3,000 levers in use. Until former Austrian territory was taken over by Italy after the war, little double-wire signalling was to be found in that country, but in 1918 there were over 2,000 levers of this type, and by 1934 there were 3,702. These figures give some idea of the extensive use of the hydraulic as compared with other systems in Italy, where it rendered remarkable service, reflecting great credit on those responsible for it. Now, however, it is only a matter of time before it disappears in favour of more modern equipment. In countries other than Italy hydraulic signalling did not achieve much popularity, though there were notable installations at the Madrid terminus of the Madrid-Saragossa-Alicante (M.Z.A.) Railway; at Amiens, Valenciennes, St. Denis, and other stations on the Northern of France; at Wahn near Cologne in Germany; on the old Vistula Railway, Russia; and on a few other Continental lines; many of these subsequently disappeared. A small frame was used for the interlocking of the Tower Bridge, London, in 1894, another was put in on the old Madras Railway, and in 1899 a 66-lever frame was supplied by Saxby & Farmer for Salt River station, Cape Town; there were also some small hydraulic frames at one time on the Great Northern and Great Eastern Joint system.

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Testing of Locomotives

THE steam locomotive has been called one of man's most paradoxical machines, and many reasons might be given to justify this epithet. In the opinion of Mr. Lawford H. Fry, on whose behalf no introduction to our readers is needed, one of the most valid reasons is the fact that in spite of over 80 years of recorded tests and research, locomotive engineers are still in disagreement as to some of the fundamental principles of operation. This view was expressed by him in an article entitled "Suggestions for Locomotive Testing" which appeared in a recent issue of our American contemporary, the *Railway Age*. The article went on to state that if the extensive programme of locomotive tests proposed in America, is to be of value, it should be preceded by careful consideration of the many tests that have already been made. There is great need of systematic study of extensive locomotive test data which have already been accumulated, and in the interest of further progress it is important that this study be directed to establishing a general theory of locomotive operation. The process by which the energy in the coal fire is transformed to produce transportation needs to be broken down into a series of relatively simple processes which can be studied individually. A large amount of locomotive testing has been done, and many reliable data are available.

In America, a series of tests has been proposed, applying cylinders of various dimensions under the same boiler to study the effects with varying proportions. This proposal fails, however, to take into account the lessons which should

have been learned from earlier tests, and we are reminded that in stationary power plants it is not considered necessary to combine a test of the steam turbine with a boiler test. Boiler and cylinders are not an inseparable unit; the capacity of the boiler limits the power that can be taken from the cylinders, otherwise the two are almost entirely independent. Recognition of this fact is surprisingly incomplete considering the experimental evidence available. The evidence that boiler and cylinders can be tested and studied as separate entities seems to be conclusive, and if this is recognised any future programme of tests can be made simpler and more effective. A line of investigation which holds out much promise arises from the fact that the available data as to the relationship of boiler heating surface and firebox capacity show that in no test, even at the maximum output, did the heating surface absorb appreciably less than 77 per cent. of the heat offered to it, nor at the lowest output was more than 87 per cent. absorbed, whilst the overall boiler efficiencies varied from about 50 to 80 per cent. It is very evident from these figures that the steaming capacity of a locomotive boiler is never limited by failure of the heating surface to absorb heat. It is limited only by the capacity of the firebox to produce heat, and this capacity depends on the quality of the fuel, the design and dimensions of the grate, and on the firebox volume.

Mr. Fry points out that the main purpose of his article is not to suggest further test work, but rather to urge the desirability of first analysing existing data, and the aim should be to establish a general pattern of the vital processes of the locomotive. With this done, further testing can be planned in relation to the whole science rather than as a test of an individual locomotive. In dealing with the cylinders, the available data relating steam consumption and power to cut-off and speed would yield valuable information if properly correlated with characteristics of design, whilst certain general principles can be established from existing data and used as a basis for laying out a further programme for research. The author concluded by saying that in his opinion there are great possibilities of improvement and economy in the steam locomotive, and that the way to realise them is through extended testing. It is, however, certain that if such test work is to have its full value the existing data should be analysed and collated, and a general agreement reached as to the principles which underlie locomotive operation.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Developing the Steam Locomotive

London, S.W.1, March 15

To the Editor of The Railway Gazette

Sir,—It must be conceded that to effect further improvements in the steam locomotive and raise its efficiency involves a difficult task for the designers. Boiler pressures may be increased and superheat temperatures carried higher, together with other additions, all adding to the first cost and that of operation without securing the results expected. Superheating beyond the point which gives reasonably dry steam entails a heavy maintenance cost, the varying temperatures being unlike those experienced in stationary practice, and whilst the softening and heating of feedwaters may help to reduce wear on the boiler, the renewal and inspection of cylinders, valves and pistons represent a serious item.

It is thus a question of how it may be possible to increase the power output of the locomotive without adding to, but, indeed, reducing the fuel consumption unless at the expense of much complication of detail. The proposals which follow have, it is agreed, their defects, but these are principally concerned in the adaptation of a system which has already proved successful in other avenues of power production. They consist briefly in leaving the locomotive as it is, with two, or three cylinders, boiler pressure not less than 200 lb. per sq. in., plus moderate duty superheaters giving a total temperature of 450/500 F. Instead of the exhaust going direct from the cylinders to the blast pipe, it is made to pass to a low pressure turbine geared to one or other of the driving axles, and thence partly to a condenser in the tender, and partly direct to the atmosphere. A dual control would be provided for reversing and coasting in conjunction with the main engine layout, enabling the turbine steam to be by passed to the blast pipe as desired, whilst for heavy gradients there is provided a live steam valve, the engine cylinders exhausting direct to the blast pipe when this is used, the turbine then doing booster work at the same time.

Of course no correct estimate can be made of the increased power when the locomotive is operating with the exhaust to the turbine, but with a cylinder exhaust of, at the worst, 60/80 lb. pressure, the turbine should improve the power output by 20 per cent. and reduce fuel consumption by a like figure, altogether apart from the advantage of having the turbine operating as a booster when required.

Generally such a layout has many advantages over a turbine locomotive as ordinarily constructed, and apart from the additional first cost would beat any ordinary compound locomotive on steam consumption when operating on the exhaust from the cylinders. Getting the most out of once used steam suits the turbine admirably as is proved by the great success of the system in the marine world. However, it does not of necessity follow that one form of power generator will do equally well in another sphere. There are difficulties, particularly in connection with the space occupied and fitting such an installation in the case of a locomotive. However, some compromise might possibly be made to obtain most of the advantages in the locomotive field.

E. S.

[Although it may be difficult to increase the thermal efficiency of the steam locomotive over the highest values so far obtained, there remains much scope for improving that of great numbers of existing locomotives simply by the application of the Chapelon principles, to which we have frequently drawn attention of late.—Ed *R.G.*]

The Franco-Polish Railways.—We learn that following the forthcoming payment of the second instalment of the loan granted to the Cie. Franco-Polonaise des Chemins de fer (Franco-Polish Railways Company), bringing it to fr. 540 millions, the works in connection with the Upper Silesia-Gdynia main line will be resumed in Spring. These comprise a line from Nowe Herby to Gdynia, and a 55-km. branch from Siemkowice to Czenstochowa. Also, in the course of the present year the company will presumably purchase the rolling stock at present owned by the Polish State Railways, and take over the working of the whole line. The company was formed in 1931 to complete and work the railway line from the coalfields of Upper Silesia to the Baltic coast at Gdynia, and, as recorded in The Railway Gazette of April 24, 1931, it was authorised to issue bonds, guaranteed by the Polish Government, in three instalments, to a total value of fr. 9 to 11 hundred million. The main line was completed and opened on March 1, 1933 (see The Railway Gazette of March 3, 1933), and was worked by the Polish State Railways. At present there are 466 km. of line opened, of 1·435 m. gauge.

PUBLICATIONS RECEIVED

Canada, 1937. Ottawa: Dominion Bureau of Statistics. 8½ in. × 5½ in. 191 pp. Illustrated. Price 25 cents.—This, the official handbook of present conditions and recent progress in Canada, is a most informative introduction to the Dominion for the British reader. The chapters on the various industries of the country are well documented with statistical tables, and the introductory chapter puts forward a general survey of Canadian trade and finances at the close of 1936. It is shown that the country's foreign trade last year, particularly the export trade, has expanded much more rapidly than international trade as a whole, a condition vital to the welfare of a Dominion which in exports *per capita* surpasses nearly every other nation. Railway freight movement reflected the growth of activity by being 9·5 per cent. heavier at the end of September than at the same time in 1935. A century of railway progress is represented by illustrations of the *Dorchester* locomotive of 1836 on the Champlain & St. Lawrence Railway; the first Canadian transcontinental train, which left Montreal for Port Moody on June 28, 1836; and modern streamlined locomotives of the C.N.R. and C.P.R. A table of railway statistics month by month for the three years 1934–36 inclusive show show gross operating revenues for the past year have recovered from the slight setbacks recorded in some months of 1935.

Die Entwicklung der Schaltung des Elektrischen Stellwerks von Siemens und Halske (V.E.S.). (The Development of the Circuits of the Siemens and Halske Electric Power Signalling System.) By Dr. Ing. W. Schmitz. Berlin-Siemensstadt: Reprinted from *Zeitschrift für das gesamte Eisenbahn-Sicherungs- und Fernmeldewesen*, Nos. 8, 10, 12, 13, 14 of 1936, as Publication No. 293 of the Vereinigte Eisenbahn-Signalwerke. 8¼ in. × 11⅝ in. with diagrams. 21 pages.—If ever a comprehensive history of railway signalling is written, one of the most fascinating parts will be that tracing the development of circuit design, or the evolution of the various cross-protection and safety circuits which have been used in connection with electric signalling apparatus, especially in power signalling installations. Although the subject has received a certain amount of attention in connection with block and lock-and-block apparatus, it is in power installations that the most important work has been done. Germany has contributed greatly to it, ever since the first Siemens and Halske all-electric apparatus was installed at Prerau, Austria, in 1894; and at Westend (Berlin), on the Prussian State Railways, in 1896. In the present publication Dr. Schmitz, who has for some time been devoting attention to the history of signalling and the relative merits of the numerous devices used in various parts of the world, explains in chronological order the circuit arrangements used for point and signal operation and for block working, either within station limits or between stations, in conjunction with the different patterns of electric power frame from 1896 to the present day. It is particularly interesting to see how the thoughts of German engineers have moved along lines parallel to those of their foreign colleagues. A series of 48 diagrams enables the author's explanations to be followed easily.

Dr. Schmitz has confined himself to the apparatus developed by Siemens and Halske, whose signalling activities are now incorporated in the V.E.S. concern, but even with this limitation his work is of great value. The most important part is that dealing with point control circuits. In signal and block working, the German system of having a station supervisor controlling all the cabins in his area has led to the adoption of many circuits having practically no equivalent in British practice, and the block apparatus is of a type unknown in this country. These parts of Dr. Schmitz's work are therefore largely of theoretical interest to British readers, but the whole nevertheless forms an important contribution to signalling literature, to be read with advantage by all signal engineers.

The British Isles.—A survey in illustrations of these islands as provided by this attractively arranged little annual publication, prepared for free distribution by the Travel and Industrial Development Association of Great Britain and Ireland, leaves the average Englishman with an unfamiliar glow of self-congratulation. How envious must be the foreigner who knows England not as one who only England knows; from that wider viewpoint how much more inspiring must be the serenity of the Wye, the solitary heights of Snowdonia, the rugged ranges of the Western Highlands, the deserted glens of Antrim, or even the dim religious light of Canterbury Cathedral. Added to all these, the visitor to the British Isles in this Coronation year of King George VI, is treated to the richest and most solemn pageant of might and pomp that any nation can show the world. This booklet is a worthy effort to capitalise such a heritage as the British Isles.

Lighting Units.—An informative article entitled "The Science of Seeing," serves as preface to this illustrated catalogue of lighting equipment for indoor illumination and commercial display from Crompton, Parkinson Limited, Bush House, London, W.C.2. Many types of reflectors, diffusers, and associated equipment are listed, with diagrams showing the distribution of light obtained. The catalogue is a valuable guide to the correct interior lighting of business premises, with its associated benefits of increased efficiency from the staff. An interesting table shows how extremely small a proportion of total annual expenditure is contributed by lighting in the case of a variety of businesses, even when this is planned on adequate and scientific lines.

Steel Prices.—A useful chart, showing the fluctuations in price per ton of iron and steel from 1914 to 1936 (with space allowed for 1937 movements) has been issued by Head, Wrighton & Co. Ltd., Teesdale iron works, Thornaby-on-Tees. Clearly printed in colours, on stout card, it has the durability which the value of its information demands. Influences on prices, such as strikes and tariffs, are indicated, with their duration, the years being divided into quarterly periods. Separate curves, differentiated by colour, are drawn for seven varieties of iron and steel, and the variations in the bank rate throughout the period covered are also shown.

Easing Oil.—A valuable medium for releasing corroded metal parts—seized nuts and bolts, for instance—has been produced by Fletcher Miller Limited, Engineers' Chemists, Alma Mills, Dukinfield, Manchester. Known as Flick, it is a penetrative easing oil that saves effort, broken parts, and stripped threads. When the seizure is in an inaccessible position, Flick can be applied by capillary action through wicking. Otherwise, it is necessary only to scrape round the affected part and apply Flick in the same way as an ordinary lubricating oil. Flick has the advantage of being harmless to metal, wood, or packings, and is claimed to be quicker in penetrating and more effective in action than paraffin.

Industrial Heating Equipment.—The Selas Gas & Engineering Co. Ltd., Selas Works, Manchester, 15, sends an illustrated loose-leaf catalogue of industrial heating equipment for all purposes and processes. Among the principal sections in this catalogue is one describing the firm's patent gas-and-air mixing apparatus, which is made in nine standard sizes, with capacities up to 25,000 cu. ft. of air-gas mixture per hour. This equipment is of unlimited application to all industrial heating purposes, in which it is guaranteed to effect substantial gas economies, with automatic control of heating conditions. Another important range of Selas products comprises gas-fired muffle furnaces for working temperatures up to 1,250° C., using gas at ordinary low pressure (3-in. water gauge). Among the other gas-fired furnaces listed are tilting types for melting non-ferrous metals, and for aluminium melting and maintenance; also soldering iron stoves and miniature furnaces. Special plant is supplied for heating locomotive, carriage, and wagon tyres of all types and sizes. Together with the equipment already mentioned, the catalogue lists and illustrates the comprehensive range of Selas burners, immersion heaters, soldering irons, and other accessories for industrial uses of gas heating.

THE SCRAP HEAP

SIXTY-FIVE YEARS OF SEASONS

Two wars, two booms, one great depression have come and gone, but Mr. Hocombe, solicitor, whose home is at Pinner, has always arrived at his office in John Street, Bloomsbury, by 10 a.m. To a reporter of *The Daily Express*, who interviewed him after he had taken out a season ticket that launched him upon his sixty-sixth year as a regular holder, Mr. Hocombe, now aged eighty, said: "I see a railway company has been boasting that one of its passengers has had a season for sixty-two years. I think I beat the lot." Asked if he had seen many changes, Mr. Hocombe said: "Tremendous! It used to be so cold I had to carry a rug. The carriages rattled and jolted. I used to catch the nine o'clock train and get to the office at ten o'clock. Then they put on what I call a modern train—it was about thirty or forty years ago. It leaves at 9.36 and I'm in the office at ten o'clock still." During his sixty-five years at work his fares have totalled nearly £1,500. "I wrote to the company a year ago complimenting them on the fact that I had never had an accident," he said. "I suggested a free pass for a year. But they did not fall for that."

* * *

FROM THE TAY TO TRONDHJEM

Norwegian papers report a remarkable find on the coast near Trondhjem, consisting of what is supposed to be a door from one of the carriages forming part of the ill-fated train that fell from the Tay bridge during the gale. The door has been sold by public auction as wreckage, but is still in the possession of the purchasers, who think it probable that somebody in this country may like to possess it.—*From "The Times" of July 22, 1882.*

* * *

ENGLAND'S FIRST FLYING MEETING

It is only a little over a quarter of a century since the first flying meeting was held in this country, and a correspondent sends us a railway bill (which is in his collection) advertising an excursion to this meeting, which was held at Doncaster. The bill is of great interest for the fact that it advertises for the first time an excursion to an air meeting in this country; it was printed by Waterlow in 1909, and that firm has no copy left, neither has the L.N.E.R. The train advertised started from King's Cross, and stopped at Hitchin about 6 o'clock in the morning, leaving there again at 6.12 a.m., stopping at all stations as far as Yaxley. Day trip passengers (the meeting lasted a week) could return on the same day on the 7.40 p.m. from Doncaster. Passengers holding 2-, 3-, or 4-day tickets could return on any of the three following days by any ordinary train. Our correspondent writes: "I was one who was keen enough to travel that distance to see two or three weird machines rise a few feet from the ground and flop along for a hundred yards or so . . . . . in these days one does not even glance up at our latest aircraft." Incidentally, among the prizes offered at the meeting was the "G.N.R. Cup."

G. N. R.

ENGLAND'S FIRST FLYING MEETING!

MONDAY, 18TH OCTOBER, 1909,

SPECIAL EXCURSION TO

DONCASTER

WILL LEAVE	AT	Return Fares, Third Class. DAY s.	d.	2, 3 or 4 DAYS. s.	d.
	a.m.				
HITCHIN	6 12	9	6	No Bookings	
THREE COUNTIES	6 19	9	0		
ARLESEY	6 22	8	9		
BIGGLESWADE	6 31	8	0		
SANDY	6 37	7	6	8	6
TEMPSFORD	6 44				
ST. NEOTS	6 52				
OFFORD	6 59	7	0	8	6
HUNTINGDON	7 5				
ABBOTTS RIPTON	7 14	6	6	7	9
HOLME	7 24				
YAXLEY	7 31	6	0	7	0

Day trip passengers return same day only from Doncaster at 7.40 p.m.

Passengers holding 2, 3 or 4 days' tickets return on October 19th, 20th or 21st from Doncaster by any ordinary train.

Children under 3 years of age, free; above 3 and under 12, half-fares. Tickets are not transferable, and will only be available on the dates and at the stations named, and by the trains advertised; if used on any other date, or at any other stations, or by any other train than those named, the ticket will be forfeited, and the full ordinary fare charged. No luggage allowed to Day-Trip Passengers, but Passengers taking Tickets for a longer period than one day will be allowed 60 lbs. of luggage free, under their own care, for which the Railway Company will not be responsible.

The Company gives notice that tickets for these excursions are issued at a reduced rate and subject to the condition that the Company shall not be liable for any loss, damage, injury, or delay to passengers arising from any cause whatsoever.

This Programme is subject to alteration by special notice, or, in the event of flying not taking place, the Company reserve the right to cancel the special arrangements.

TICKETS, BILLS, and all Particulars can be obtained in advance at the Stations.

For information respecting Excursions apply to J. HARDY, District Manager, G.N. Rly., Peterboro'.

London, King's Cross Station, October, 1909. OLIVER BURY, General Manager.

3,000—7-10-09. W. & S. Ltd. D. (8010)

Handbill advertising a G.N.R. excursion to the first flying meeting in England

No. 5 of a new series—the third—of "claims prevention" posters issued by the Chief Goods Manager, G.W.R., for exhibition to the staff

The British main-line railways buy annually from the brickfields 19,757,000 bricks; from British mills 2,047,000 yards of cloth; and from British steelworks 259,000 tons of rails. In addition, thousands of British miners are regularly employed in mining the 14,484,000 tons of coal required each year for the 19,817 locomotives, and steamships, hotels, offices, works, and so forth.

* * *

G.W.R. VERSATILITY

Three thousand actors, poets, orators, and musicians invaded Reading on March 10, taking possession of four halls, including the Town Hall, until the end of the week. They were competitors in the fourteenth annual musical festival of the Great Western Railway, and the 82 classes into which the competitors were divided covered practically every phase of dramatic and musical art. Participants in the dramatic competition presented scenes from "Othello," "As You Like It," and the "Merchant of Venice." The silver cup for the best scene was won by the Port Talbot Players, with goods porter Cyril Jenkins as Othello, and shunter E. Jones as Iago. Among the musical features of the festival was a veterans' choir contest, in which the average age of the competitors worked out as 73. In the public speaking contests, eloquence was heard upon "Making a Success of Life"; "The Wisdom of Learning"; "Courage"; "Physical Fitness," and "No one has less independence than he who has never learned obedience."

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

SOUTH AFRICA

Table Bay Harbour Extension

The Cabinet has sanctioned the long range and foreshore reclamation scheme for Table Bay harbour, as introduced by the Minister of Railways & Harbours. The outstanding features of the scheme are:—

(1) The construction of a new mole nearly 1½ miles long across Table Bay, from Woodstock Beach, near the swimming baths, to within 600 ft. of the knuckle berth recently constructed at the new basin entrance. Apart from its primary purpose as a harbour wall, this mole, which will be substantially built, will provide one of the finest marine promenades and deep-water fishing spots in the world.

(2) The removal of the random block mole which was built at a cost of £300,000 during the last 10 years. The blocks will be used for other parts of the scheme.

(3) The provision of three new deep-water berths to be known as E, F and G berths, extending from the south pier for 3,000 ft. to a point (now in Table Bay) that will cut across the vision line of Adderley Street.

(4) The construction of a temporary embankment as a continuation from G berth towards Woodstock, terminating at the shore end of the new mole. The deep-water section of this embankment will be so constructed that it will be possible in future to erect quay walls and additional berths along its enclosed side, and

(5) The reclamation of 363 acres of land from the sea, extending from the existing south pier to a point beyond the Woodstock baths.

The Adderley Street pier and the fishing harbour will disappear, and the sea will be pushed back from the existing promenade for more than twice the distance of the length of the pier. The scheme is estimated to cost about £2,250,000, and when completed will provide Cape Town with one of the finest artificial harbours in the world, capable of accommodating ships of any size. [The works appear to be in connection with and in extension of those referred to in our issue of May 8, 1936. —ED. *R.G.*]

CANADA

New C.P.R. Equipment Programme

The C.P.R. $20,000,000 new equipment programme includes 50 locomotives, 30 passenger and express cars, and 3,600 freight cars of various types. Thirty of the locomotives, which are being built by the Montreal Locomotive Works, are of a modified "2800" class with a certain amount of front-end streamlining, and arrangements for the deflection of smoke from the cab windows. The other engines are on order from the Canadian Locomotive Company at Kingston, Ontario. Most of the 50 locomotives are for passenger services.

The Canadian Car & Foundry Company, of Montreal, has secured orders for 1,700 box cars, and 200 automobile cars; and the National Steel Car Company of Hamilton is building 200 50-ton drop-ender cars, 1,110 box cars, 300 50-ton hopper cars, 100 75-ton gondola, and 200 50-ton drop-bottom gondola cars. The new coaches, though having the same capacity as the old cars, will each be 24 tons lighter, will be semi-streamlined and air-conditioned; the lighting will be improved and controllable by each passenger.

INDIA

Railway Inquiry Concluded

On the conclusion of its investigations, the Wedgewood Committee had to modify its original intention to draw up the report in Delhi, by reason of the delay involved in carefully sifting and analysing the mass of informative material placed before it during its extensive tour in India, and instead, has been obliged to complete the report in London. Sir Ralph Wedgewood is reported to have stated in a press interview before his departure that the financial position of the Indian railways was sounder than that of railways in many other parts of the world. Though it is premature to speculate on the nature of the recommendations likely to be made by the committee, it is believed that Sir Ralph is much in favour of the improvement of the conditions of travel for third class passengers as a means of recovering traffic lost to the road. The committee's report will possibly be in the hands of the Government of India in April.

Railway Loans to be Written Off

A resolution submitted by the Financial Commissioner of Railways in the Legislative Assembly recommends to the Governor-General-in-Council that the obligation of railway revenues to repay to the depreciation reserve fund the balance outstanding on April 1, 1937, of the loans taken from the fund to meet railway deficits, should now be waived, and also that they should be absolved from paying to the general revenues any contribution due—under the resolution of the Assembly of September 20, 1934—from 1931-32 to 1936-37. The resolution explains that during the last six years the railways have been compelled to borrow sums amounting to about Rs. 31 crores (£23¼ million) from the depreciation fund to meet their deficits. At the same time, since 1931-32, they have been unable to pay the usual contribution to the general revenues, which they are expected to pay under the Separation Convention of 1924. The balance of such payments in deficit also amounts to Rs. 31 crores. In his recent budget speech, the Railway Member indicated the advantages to be gained by the general exchequer if these arrears are wiped out. He also pointed out that since the adoption of the separation resolution, railway revenues had contributed Rs. 42 crores (£31½ million) to the general exchequer in addition to the loss of about Rs. 26 crores (£19½ million) borne by the railways in the working of strategic railways.

FRANCE

Suggested National Railway Company

Formation of a national railway company was advocated recently by delegates of the federated unions of railwaymen in a hearing before a parliamentary commission. In the opinion of the delegates, the railways should be administered by a national company comprising representatives of the State, social organisations, labour and, provisionally, representatives of capital, pending the elimination of capital shares. Above this company, there should be another organisation in control of all transport. The French national railway company should be decentralised, and powers delegated to provincial boards administered in the same way as the central board.

The Forthcoming Paris Exhibition: Facilities for Foreign Visitors

In connection with the Paris Exhibition to be opened in May, cards for foreign visitors, known as "*cartes de légitimation*" will be placed on sale from March 15 in railway, shipping, air travel and tourist offices throughout the world at the price of fr. 20. The cards will entitle holders to various advantages, comprising: ten half-price entries to the exhibition; reductions of 10 per cent. in the exhibition restaurants; and of 25 to 30 per cent. in the museums, and 10 per cent. in the principal theatres of Paris. French railways will give reductions of 50 per cent. on condition that the tourist makes a minimum stay of five days in Paris. Price of admission to the exhibition will be fr. 6.

French railways will make an imposing show at the exhibition, which will occupy an easily accessible site on the Esplanade des Invalides adjoining the station of that name. A feature of the Nord exhibit will be the 1912 experimental 4-6-4 or Baltic type locomotive No. 3.1102, cut sectionally to show the principles of its construction and working. [This is illustrated on page 538.—ED. *R.G.*]

The Metro will be the principal means of transport to and from the exhibition, and no fewer than four lines, Nos. 1, 5, 8 and 9, and fourteen stations give access to the grounds. Arrangements have been made for adapting the signalling and rolling stock to cope with fast traffic conditions. On line No. 9 five-coach trains will run at

intervals of 90 seconds, and will be able to transport 25,000 passengers an hour in each direction. Similar arrangements have been made for line No. 1. On the other lines, the traffic is expected to be less intense.

Suggested Improvements in Metro Working

There has been talk of running a few trains on the Metro throughout the night all the year round in Paris. The Metro authorities have decided against the proposal on the ground of expense involved in organising a night staff, and also because maintenance and repair work on the Metro lines are done to best advantage during the night when the train services are suspended. Also, the idea of running express train services or trains stopping at certain stations only was rejected as impractical on the Paris Metro. But on the suburban line from the Luxembourg to Sceaux, which has been converted from steam traction, and will be opened as the first long-distance suburban extension of the Metro system this summer, a number of Metro expresses will be included in the service.

Metro Extensions and Finances

Another of the short suburban Metro extensions has just been opened. It carries line No. 11, from the Porte des Lilas to the Mairie des Lilas, which is now the terminus of the line connecting the suburb with the centre of Paris at the Châtelet. The line is only about half a mile in length, but the tunnel had to be constructed at a great depth under a hill. It is proposed to extend the line to the Fort of Noisy-le-Sec, and the tunnel has already been extended several hundred yards in that direction, and meanwhile will be used as a siding for rolling stock. Extensions of Metro lines Nos. 1, 3, and 9 to the Pont de Neuilly, Pont de Levallois, and the Mairie de Montreuil respectively, are also to be opened in the summer.

Gross earnings of the Metro Company in 1936 amounted to fr. 490,260,965, compared with fr. 501,333,808 in 1935. The decrease in receipts was specially marked during the second quarter of the year, which coincided with the period of stay-in strikes in the Paris area.

Eastern Railways Improvements

The Verdun—Eix Abaucourt section of the line from Verdun to Conflans on the Est system, as now converted from single to double line, will shortly be opened to passenger traffic. Under the treaty of Frankfort, concluded after the Franco-German war of 1870-71, this doubling had been forbidden for strategic reasons, until the great war. The construction of the second line involved some difficult engineering work, including the piercing of a separate tunnel at Tavannes. Further railway work, required by the military authorities, is to be undertaken on the Paris-Strasbourg line. Between Pagny-sur-Meuse and Frouard the line will be quadrupled. At Foug, a new tunnel 1,250 yd. long will be built, and at Liverdun two new bridges. As a precaution against air bombardments, the new and existing bridges will be about 20 yd. apart. The new construction work is estimated to cost fr. 200,000,000.

CHINA

Chengtu-Chungking Railway

The construction and operation of this new line, unlike those of any other railway in China, will be undertaken by a private company with integral freedom of action, though with Government assistance as and when required. There will be Government holdings, but these may be sold to private investors if convenient. For the first time for many years foreign assistance in railway construction will include substantial sums in cash as well as the usual long-term loans on supplies of materials from a foreign country. The estimated cost of construction is $54,500,000, and the Chuan Chien Railway Company has been formed with an initial capital of $20,000,000, under special charter, for the undertaking. The balance, $34,500,000, will be provided by a French syndicate, $27,500,000 in material and $7,000,000 in cash. The line will be 523 km. in length and will connect two great centres as well as tapping the richest part of Szechwan Province.

TANGANYIKA

Finances and Traffics during 1936

The total revenue of the Tanganyika Government Railways for 1936 was £660,203, a figure greater by £66,908 than the 1935 total, and £72,703 or 12·4 per cent. above the estimated revenue of £587,500. The following are details of the receipts :—

	1935 £	1936 £	+ Increase — Decrease
Coaching ...	83,492	98,032	+ 14,540
Goods ...	484,395	537,084	+ 52,689
Telegraph and sundries ...	20,765	20,590	— 175
Steamship services ...	4,643	4,497	— 146
	593,295	660,203	+ 66,908

Tonnages via the Central line increased from 95,515 to 108,990, or by 13,475 tons; and via the Tanga line from 75,056 to 78,299, an increase of 3,243 tons.

VICTORIA

The New Sydney Limited

The new semi-streamlined, all-steel, air-conditioned Sydney Limited trains are to run non-stop from Melbourne to Albury, 190½ miles, and will be hauled by "S" class Pacific locomotives with a new type of 12-wheeled tender, carrying 13,000 gallons of water. Speeds up to 70 m.p.h. will be permitted and required, and the improvement of the track will allow of 40-ch. curves being taken at 55-60 m.p.h. Heavier points and crossings will allow of 60 vice 55 m.p.h. speeds over them, and to permit of smoother running the layouts at Wallan, Wandong, Kilmore East, Broadford, Violet Town and Bowser stations have been modified.

New 4-8-4 Type

A new type of locomotive to be known as the "H" class, of the 4-8-4 type, has been designed for the heavy traffic and grades on the Melbourne-Ararat section of the Adelaide main line. Double-heading will be eliminated by the use of this new type of engine, which is known as the "Poncono." The building of the first of this new class is already in hand; it will be the most powerful in Victoria.

NEW SOUTH WALES

New Pacific Locomotives for Tasmania

To cope with the increasing traffic on the 3 ft. 6 in. gauge system in Tasmania, some new 4-8-2 type locomotives are at present being built by the Clyde Engineering Co. Ltd., of Granville, New South Wales.

First Steam Tram Motor to be Preserved

As an object of historic interest, the first Baldwin-built steam tramway power unit is to be preserved by the New South Wales Tramways administration. This unit or motor, No. 1, inaugurated steam traction on the system in September, 1879, horse traction having been previously used from the opening of the first tramway in 1861. No. 1 is still running, in rebuilt form, on the Kongarah-Sans Souci tramway.

NEW ZEALAND

Clearing the Main Line

Due to heavy rainfall a hill-side slip occurred on the main trunk line, near Paraparaumu, completely blocking the track. Before warning could be given, an Aukland—Wellington express, headed by a "K" class 4-8-4 type engine, plunged into the obstruction, and was derailed and capsized down an embankment. Fortunately, two very powerful 40-ton Craven breakdown cranes had recently arrived from England, and had, as their first big job, the rerailing of the locomotive. The illustrations on page 000 show how they first righted it, then drew it up parallel to and nearer the track and finally lifted it to rail level. With these cranes a long and difficult job was converted into a comparatively quick and easy one. The "K" class engines each weigh 84 tons 16 cwt., and their tenders 50 tons, in working order. Under test, one of these cranes lifted 48 tons at 16 ft. radius, no mean feat for a 3 ft. 6 in. gauge crane.

WHITE BEARING METALS FOR HEAVY DUTY

II.—*Performance of Finished Bearings*

HAVING examined the principles which underlie the casting of a sound and accurately moulded white metal liner, we may next consider details of design and their influence upon the troubles experienced under adverse conditions of service. We have seen that the microscopic structure of a white bearing alloy comprises a matrix which is sufficiently plastic to permit the journal to obtain an adequate seat, and in which are embedded certain hard wear resisting constituents. The bearing is thus enabled to conform to physical and mechanical requirements which appear contradictory, about which more will be said later.

The earliest demands upon the bearing will be, first, resistance to imperfectly distributed load—perhaps at an elevated temperature—and secondly a capacity for absorbing induced internal stresses. Deficiency in the first respect will cause spreading and, in the second respect, cracking, both of which may finally cause separation of the liner from its shell. If the inherent plasticity of the alloy has been largely expended in overcoming contraction stresses, there will result an apparent brittleness in the form of a tendency to crack in service. The combined effects of lateral and circumferential tension stress in the liner caused by even normal journal pressure may result in the limiting safe working stress (fatigue limit) being exceeded. This limit is approximately ± 2 tons per sq. in., for Babbitt metal. Internal stress in the liner due to contraction is found to be more uniformly distributed if the keying grooves in the shell are circumferentially and not axially disposed. The latter arrangement sometimes causes the white metal lining to pull away from the shell so as to form an unsupported bridge between two axial grooves.

The effects of uneven loading may become noticeable even under normal conditions of load application, that is, in the absence of "pounding." There is a sharp rise of oil pressure at the interface between journal and white-metal, and a marked decrease of fluid friction, with correspondingly accelerated wear. The defect may be aggravated by flexure of the bearing shell or "brass." The remedy for this must be sought in mechanical and metallurgical devices which it is beyond the province of this article to describe.* However, even if we assume that the design of the axlebox is sound; the bearing shell rigid; the lubrication system efficient; the arc of contact between whitemetal and journal correct; and that the bearing has been properly run in, we shall even then not have covered all the sources of overheating.

Some elaborate experiments conducted by the German State Railways at Göttingen, and reported in 1927,† covered this question very thoroughly. Among the causes of uneven loading which were investigated, the most important were:—

(*a*) Deflection of the axle itself, causing uneven contact between journal and bearing. The oil flow is deflected towards one extremity of the bearing, thus adding local overheating to local wear. Figure 4(A) illustrates the defect diagrammatically in the case of a wagon axle.

(*b*) Oblique pressure of the bearing spring upon the axlebox, due to warped frames or to neglected maintenance of the spring rigging. The remedy for this needs no explanation.

(*c*) Collar friction due to (*a*) and (*b*) and to the unavoidable inequalities of wheel diameter and profile.

Collar friction was overcome by paying special attention to the shape of the end faces of the bearing brass, a sectional elevation and plan of which is shown in Fig. 4 (B). The faces are flared back from the collar as the horizontal centre line of the axle is approached. The extremities

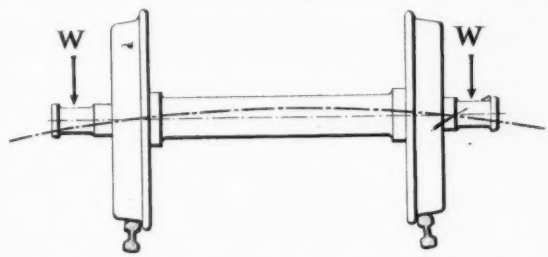


Fig. 4 (A) *Axle deflection with overhung journals*

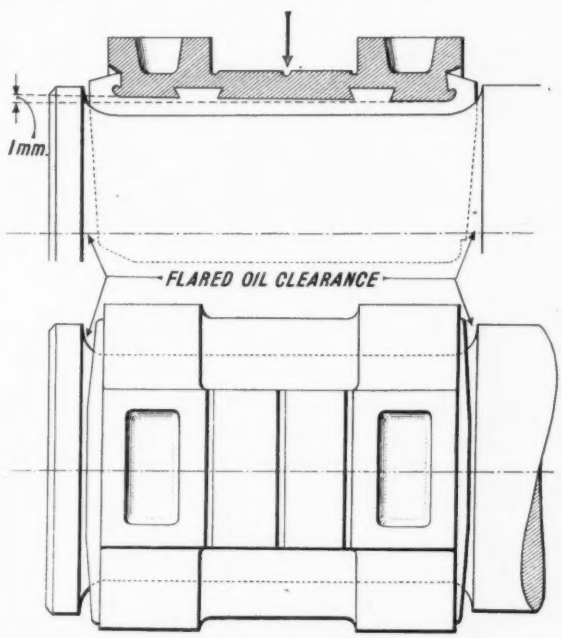


Fig. 4 (B) *Bearing designed by German State Railway to remedy collar friction and uneven loading*

remote from the crown of the bearing therefore stand away from the outer and inner collars and so provide an oil clearance. Bearings which had their end faces square with the axis of the journal were run on the test bed and were found to heat up to 130° C., with a coefficient of friction as high as 0·014. After flaring the corners as described, the running temperature fell below 100° C. and μ dropped to 0·0025. Bearings so designed were found capable of working under a collar thrust of three times the normal, without seizing.

Cases of axle deflection were met by increasing the

* Special ferrous and non-ferrous alloys for bearing shells have been investigated. Their use raises the question of what damage they may do to the journal if the white metal should melt out.

† Reichsbahnrat H. Müller: "Bearing tests and their effect upon the design of bearings for German State Railway rolling stock." Sonderheft, *Glasers Annalen I*, July, 1927.

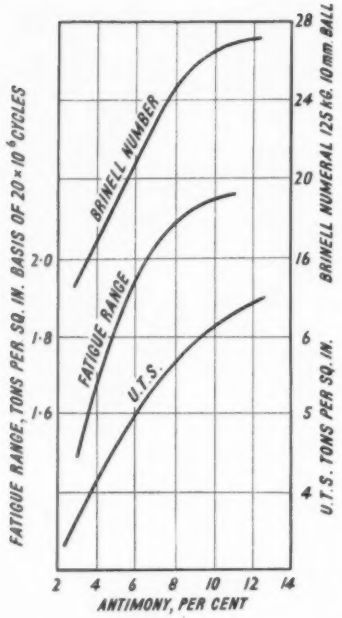


Fig. 5

Effect of increasing antimony content in a series of copper-antimony-tin alloys of constant copper content (3·5% approx.) Lead = 0·03%. Cast at 350° C. Mould at 150° C. (D. J. Macnaughtan. J. Inst. Metals LV, 1934)

thickness of the outer end of the bearing by 1 mm. as shown in Fig. 4 (B). This tilts the brass in the vertical plan to compensate for the deviation of the axle and the axlebox from the horizontal and vertical planes respectively. In cases where this expedient was applicable, the running temperatures on the test bed fell from 150-170° C. to 70° C.; the ambient temperature being 20° C.

Reverting now to further consideration of the fundamental properties looked for in a white-metalled bearing, we may profitably examine some work done in this country, and ably reviewed by Mr. D. J. Macnaughtan,* Director of Research to the International Tin Development Council. Figs. 5, 6 and 7 are reproduced from his review and from the reports of other observers whose work he has summarised. Fig. 5 shows the effect of increasing the antimony content of a series of copper-antimony-tin (Babbitt) alloys of constant copper content. The pouring and chilling temperatures shown represent possible works foundry conditions. The range 7-9 per cent. antimony is the most advantageous, as is seen from the flattening of the curves as a content of 10 per cent. is approached. The antimony-tin cubes (described in Part I) become very numerous if the antimony content exceeds 10 per cent. They are then liable to foul each other and the other hard (copper-tin) constituent also, when the soft matrix yields under load. This may result in crushing, and is best avoided. Their unnecessary preponderance cannot usefully contribute to the stiffness of the matrix itself, which governs the ability of the lining to support the journal load without undue displacement.

The alloy must, however, exhibit sufficient plasticity to flow away from zones where the pressure is greatest. Unless it can do this, lubrication may fail locally, and seizure ensue. Fig. 6 shows the results of tests made upon a Babbitt into which 1 per cent. of cadmium had been introduced. This innovation promises increased resistance to load without undue sacrifice of plastic flow. The white metal must not only flow when the bearing is being run in but it must retain its softness in certain measure throughout the life of the bearing. The flow incidental to early adjustment causes work-hardening to take place. This reaction offers temporary resistance to the load. If the hardening is cumulative, the alloy will be embrittled and will probably score the journal. When flow ceases a cycle of gradual self-annealing sets in, in the case of Babbitt. metal, resulting in an appreciable recovery of plasticity. The reactions are reversed in certain alloys of a higher lead content than Babbitt. In the presence of about 30 per cent. of lead, the work-hardening effect is suppressed by spontaneous self-annealing. This in turn is followed by a cycle of age-hardening which is followed

* "Improvement of white metal bearings for severe service. Some general conclusions." *Journal Inst. Metals*, Vol IV, 1934.

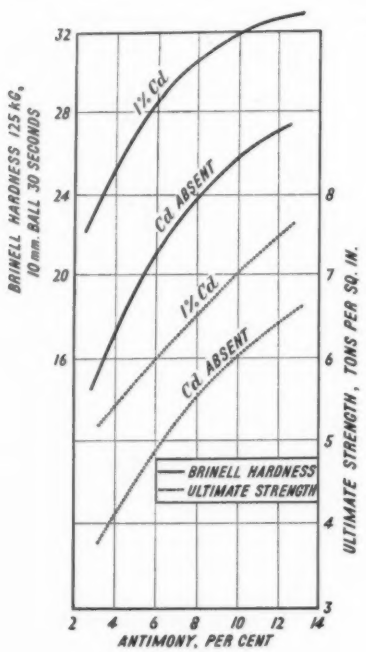


Fig. 6

Cadmium present .... Cast 360° C. in mould at 150° C.
Cadmium absent .... Cast 350° C. in mould at 150° C.
(After D. J. Macnaughton. J. Inst. Metals LV, 1934)

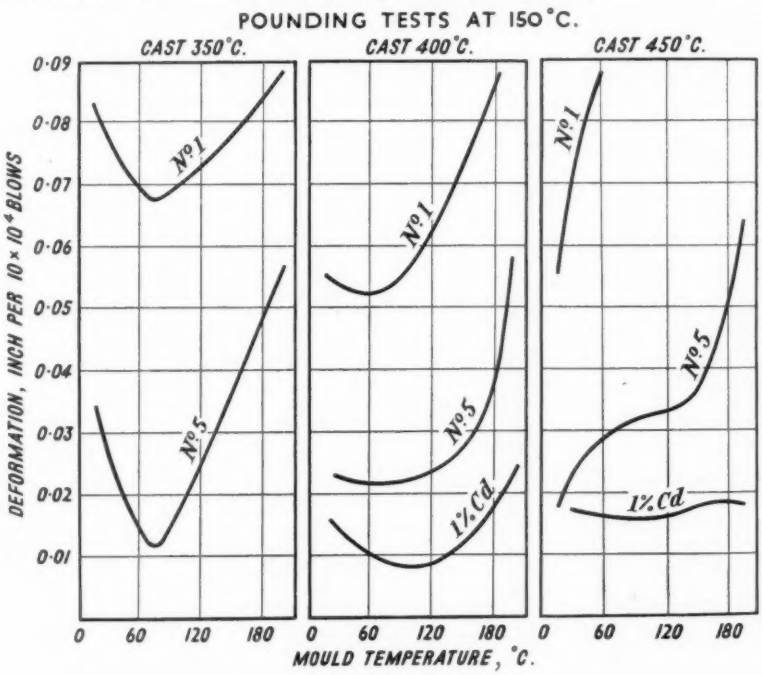


Fig. 7

	Tin %	Lead %	Antimony %	Copper %	
"No. 1"	92·3	0·3	3·78	3·55	.... Tin-base
"No. 5"	5·05	79·9	14·90	0·09	.... Lead-base

"1%Cd" No. 1 + 1% Cadmium

(After H. Greenwood, M.Sc., J. Inst. Metals LV, 1934)

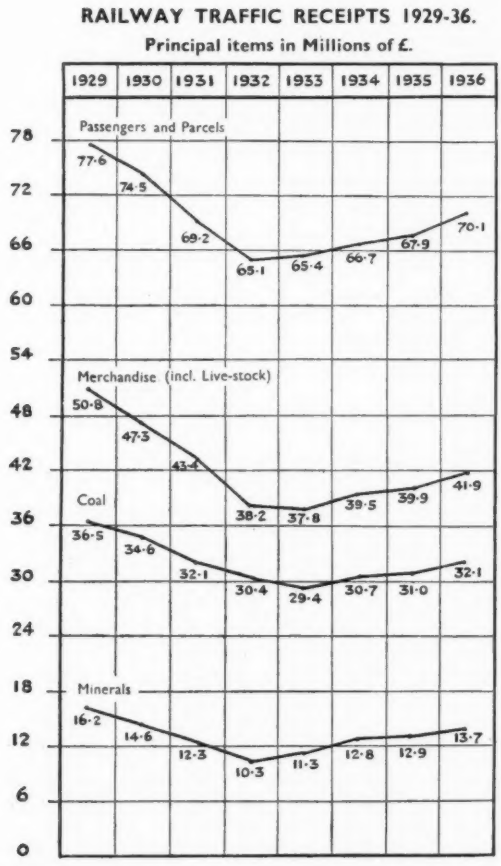
by a cycle of age-hardening during which the original hardness of the alloy may be regained, particularly if the running temperature of the bearing rises. If the temperature rise coincides with a recurrence of peak load, flow will recommence. The ultimate fate of the bearing will depend upon the incidence and duration of load and temperature changes.

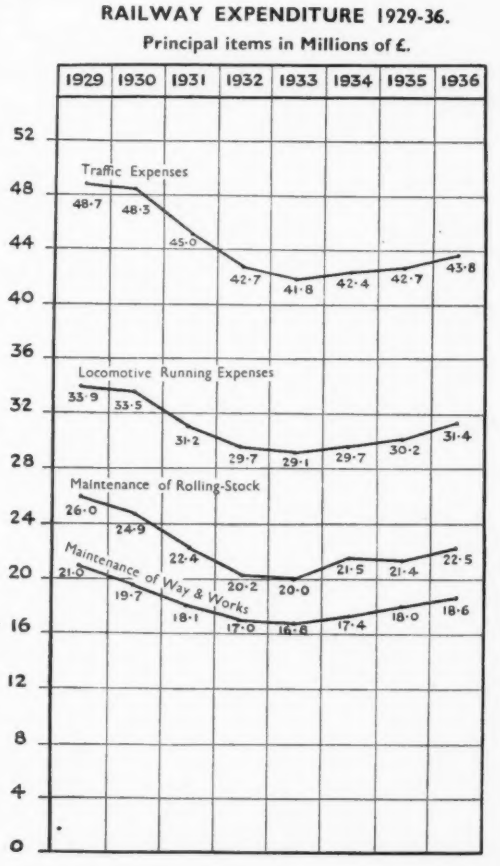
Although tin-base (Babbitt) alloys are considered generally superior to lead-base alloys for heavy duty, the latter have been shown to behave surprisingly well under pounding tests, as may be seen in Fig. 7. Among the curves shown, those which relate to bearings cast at 400° C. into shells at 100-120° C. are the most representative of works foundry practice. The Babbitt was definitely inferior to the high-lead alloy at the temperature of testing, *viz.*: 150° C., which represents a dangerously warm bearing. The striking improvement effected by the addition of one per cent. of cadmium to the Babbitt was fortunately not critical, the deformation curve being reasonably flat over the chilling range of 100-120° C. Pounding is caused by excessive vibration. Locomotive or rolling-stock bearings destined for heavy duty should be resistant to short spells of pounding at, say, 90-100° C. If the bearing is much hotter than this, or if the pounding takes the form of collar thrust, some damage to the lining seems inevitable.

The principles which underlie the production and performance of white-metalled bearings have been briefly reviewed above. Knowledge of the factors involved is still incomplete. There is a considerable number of research reports available, but they are based on the work of scattered observers working under seemingly similar, but actually different, conditions. They are not easy to correlate or to apply to a given practical problem. The demands of academical perfection are not readily reconciled with limitations of practical attainment imposed by workshops and workmen. Moreover, a bearing is a sensitive indicator of defects which may lie elsewhere. Herr Müller, reporting the German State Railways' investigations, wrote: "We soon discovered how difficult it is, in the case of rolling stock, to provide conditions under which the bearings shall be assured of a long service life."

Even normal variations in the track, in the wheels, in the spring rigging, or the lubricating system, make it difficult to preserve the optimum conditions of weight distribution and cool running, if several such variations operate simultaneously. Whatever alloy is chosen, the ultimate safeguard against failure in service must be sought equally in conscientious maintenance of the wheel and spring assembly, as in the melting and casting of the lining itself.

British Railway Traffic Receipts and Expenditure



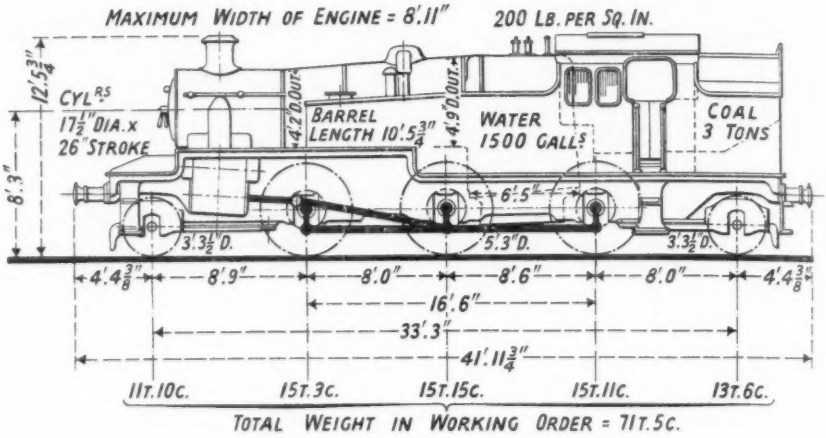


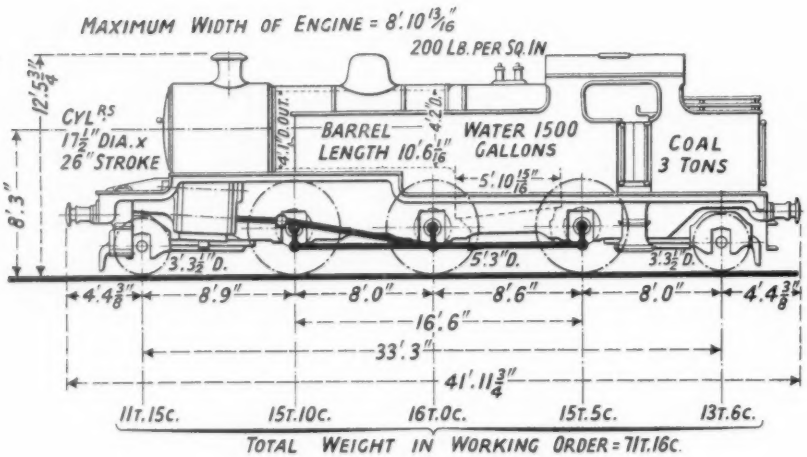
These graphs, showing eight-year curves of traffic receipts and expenditure of the four main-line railway companies, are reproduced from "Facts About British Railways," a booklet produced by the British Railway Press Office which we reviewed on page 476 last week

British Locomotive Types—VI London Midland & Scottish Railway

HEATING SURFACE, TUBES—	
LARGE AND SMALL	859·1 SQ. FT.
FIREBOX	106·9 ,,
TOTAL (EVAPORATIVE)	966·0 ,,
SUPERHEATER	72·8 ,,
COMBINED HEATING SURFACES	1,038·8 ,,
GRATE AREA	19·2 ,,
TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	21,486 LB.

3 P.T Class (Taper boiler)



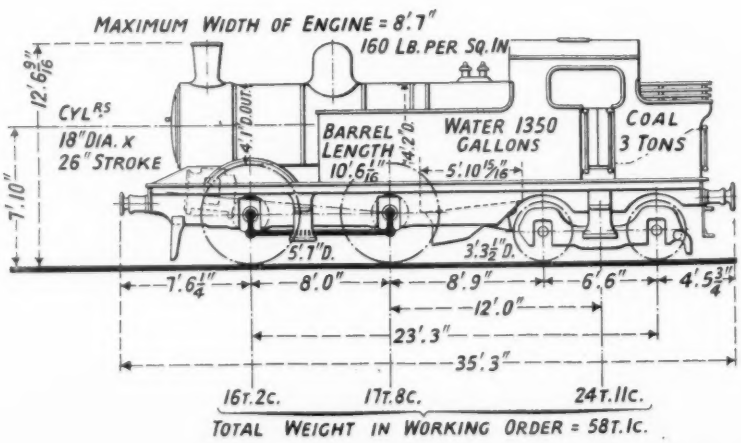


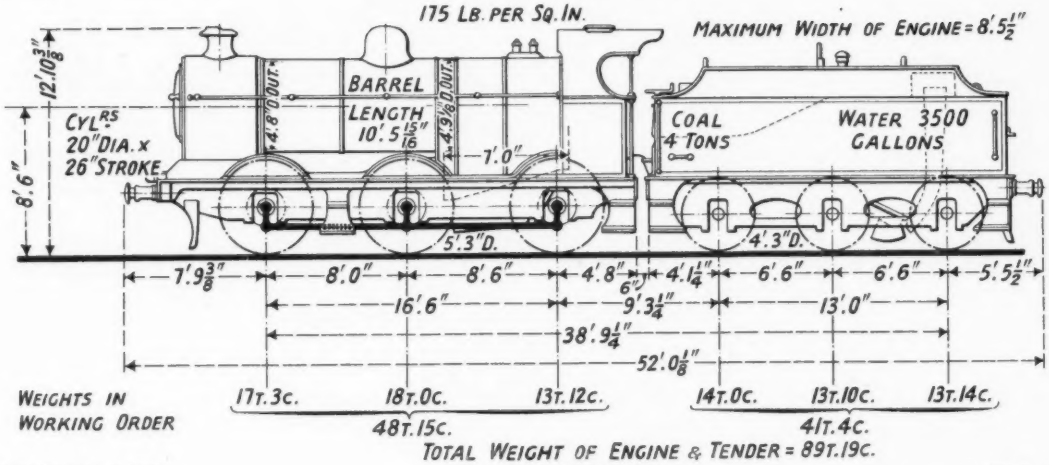
HEATING SURFACE, TUBES—	
LARGE AND SMALL ...	692·7 SQ. FT.
FIREBOX	103·5 ,,
TOTAL (EVAPORATIVE) ...	796·2 ,,
SUPERHEATER	172·7 ,,
COMBINED HEATING SURFACES...	968·9 ,,
GRATE AREA	17·5 ,,
TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	21,486 LB.

3 P.T Class (Parallel boiler)

HEATING SURFACE, TUBES—	
LARGE AND SMALL ...	902·7 SQ. FT.
FIREBOX	103·0 ,,
TOTAL (EVAPORATIVE)	1,005·7 ,,
NO SUPERHEATER	
GRATE AREA	17·5 ,,
TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	17,099 LB.

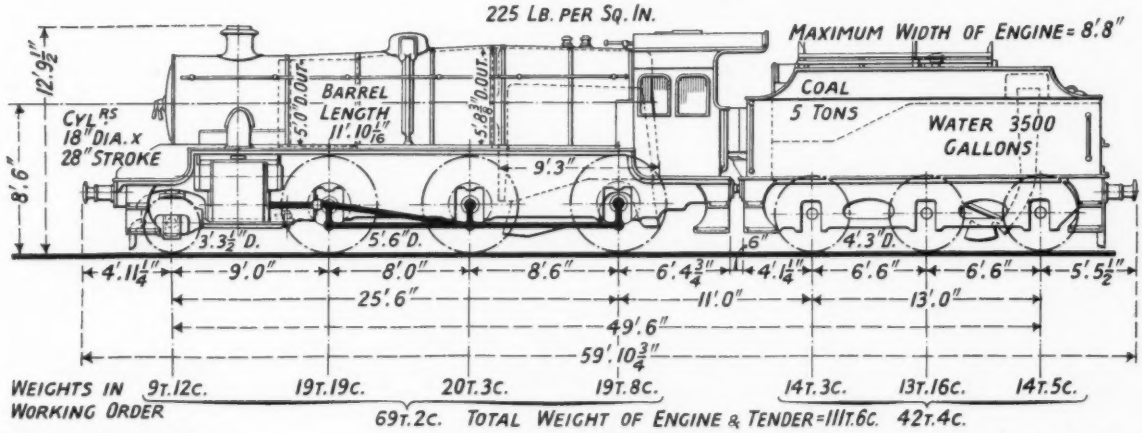
2 P.T Class





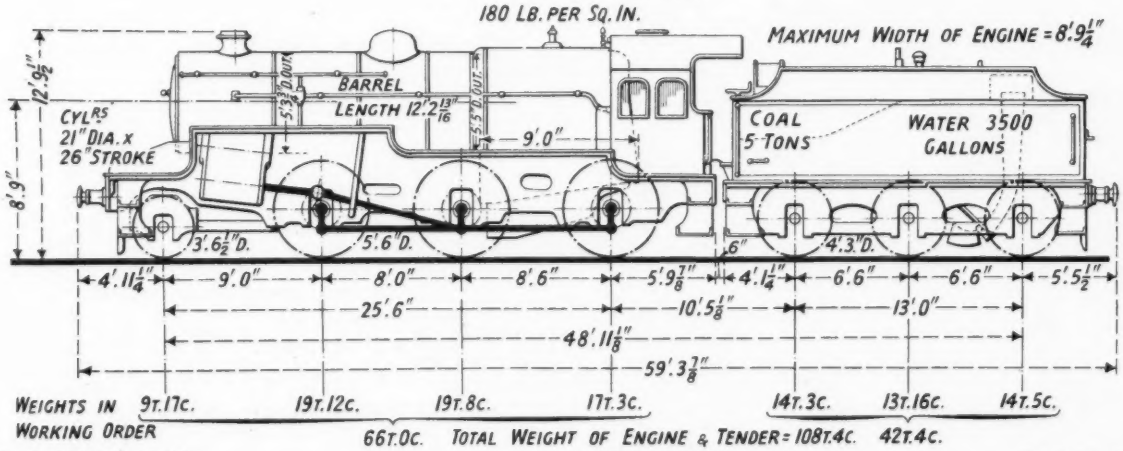
HEATING SURFACE, TUBES—		SUPERHEATER	252·7 SQ. FT.
LARGE AND SMALL	909·9 SQ. FT.	COMBINED HEATING SURFACES	1,286·4 ,,
FIREBOX	123·8 ,,	GRATE AREA	21·1 ,,
TOTAL (EVAPORATIVE)	1,033·7 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	24,555 LB.

Class 4F



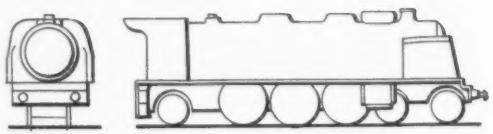
HEATING SURFACE, TUBES—		SUPERHEATER	185·2 SQ. FT.
LARGE AND SMALL	1,243·0 SQ. FT.	COMBINED HEATING SURFACES	1,583·2 ,,
FIREBOX	155·0 ,,	GRATE AREA	27·8 ,,
TOTAL (EVAPORATIVE)	1,398·0 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	26,288 LB.

5 P.4 F. *Class (Taper boiler)*



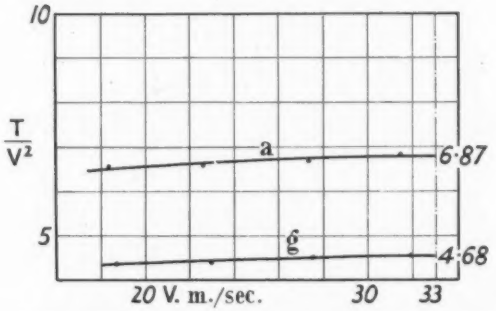
HEATING SURFACE, TUBES—		SUPERHEATER	307·0 SQ. FT.
LARGE AND SMALL	1,285·0 SQ. FT.	COMBINED HEATING SURFACES	1,752·0 ,,
FIREBOX	160·0 ,,	GRATE AREA	27·5 ,,
TOTAL (EVAPORATIVE)	1,445·0 ,,	TRACTIVE EFFORT (AT 85 PER CENT. B.P.)	26,580 LB.

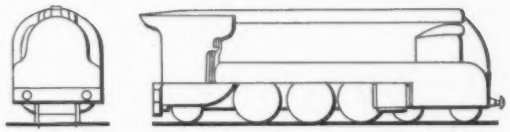
5 P.4 F (*Parallel boiler*)



a

V	18·45	22·5	27·3	31·4
T_1	2480	3750	5550	7500
$\frac{T_1}{V^2}$	7·29	7·46	7·48	7·62
$\frac{t_1}{V^2}$	0·755			
$\frac{T}{V^2}$	6·535	6·705	6·725	6·865



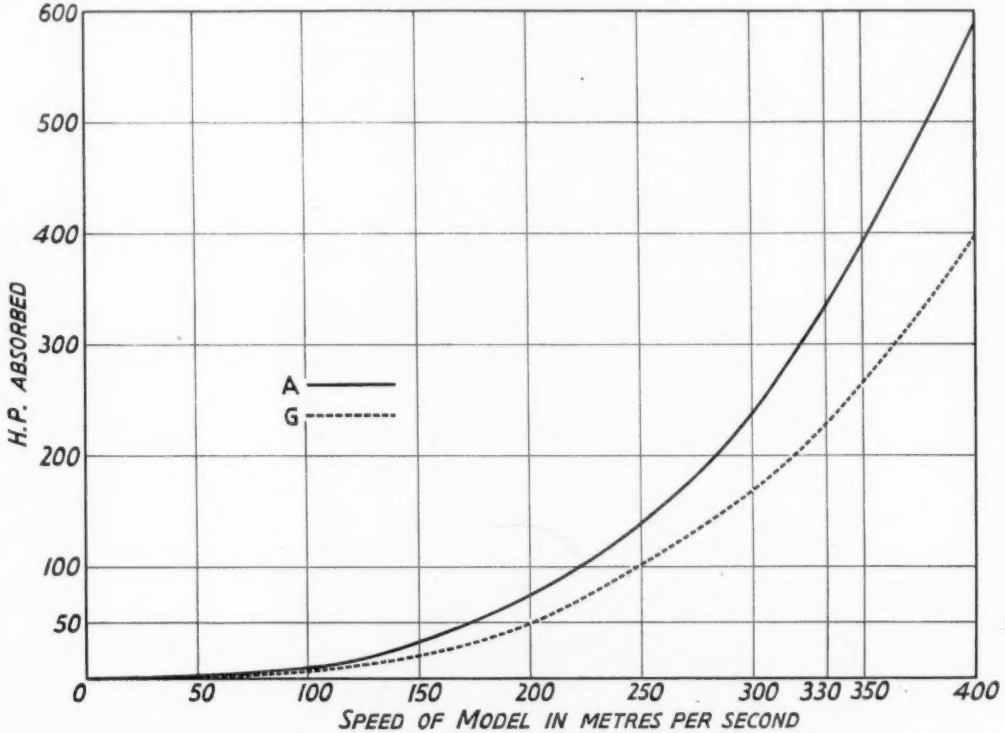


g

V	18·65	22·88	27·53	31·80
T_1	1800	2740	4045	5500
$\frac{T_1}{V^2}$	5·17	5·23	5·34	5·43
$\frac{t_1}{V^2}$	0·765	0·755		
$\frac{T}{V^2}$	4·415	4·475	4·585	4·675

A

V	C	Pcv
33·3	6·87	0·3
50	6·87	1·2
100	6·87	9·1
150	6·87	30·9
200	6·87	74
250	6·87	143·1
300	6·87	247·3
330	6·87	338
400	6·87	586·2



G

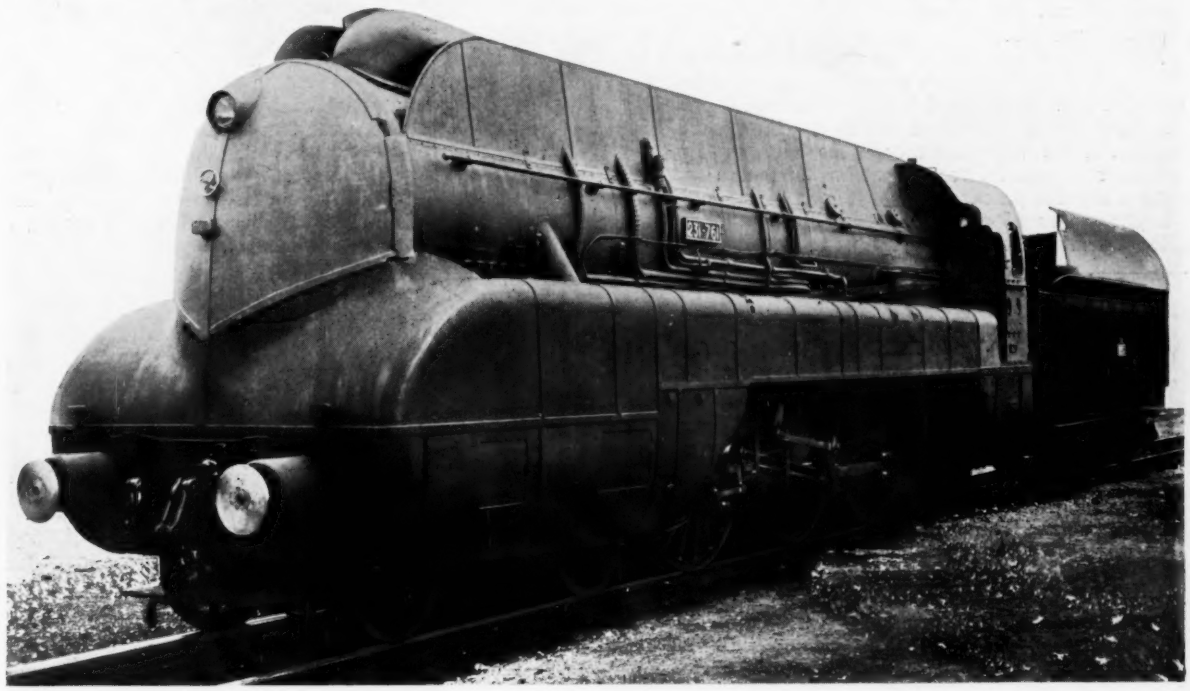
V	C	Pcv
33·3	4·68	0·2
50	4·68	0·7
100	4·68	6·3
150	4·68	21·0
200	4·68	49·9
250	4·68	103·7
300	4·68	168·4
330	4·68	230·4
400	4·68	399·3

Results of air resistance tests undertaken at St. Cyr on a model of a French Pacific locomotive
(See article opposite)

STREAMLINED LOCOMOTIVES, FRENCH STATE RAILWAYS

Wind tunnel tests show the advantages of applying a low-resistance casing to a standard type of locomotive ; also, the merits of the "A.-I." smoke-lifting equipment

THE streamline casing of the Pacific locomotive, No. 231–761 of the French State Railways, shown in the accompanying illustrations is the outcome of an elaborate series of wind-tunnel investigations undertaken by the Service des Études du Matériel et de la Traction (Department for the Study of Rolling Stock and Traction), in collaboration with the Institut Aérotechnique de Saint-Cyr and the Société l'Aérodynamique Industrielle. Paris. The tests were made on $\frac{1}{10}$-scale models in the Lelarge wind tunnel at Saint-Cyr.



Streamlined rebuilt Pacific locomotive No. 231–761, French State Railways

The aim was to develop a resistance-reducing casing capable of being fitted to existing Pacific locomotives without modifying any of the motion work or fittings, and at the same time to secure effective smoke-lifting along the whole length of the locomotive, while eliminating the high-resistance occasioned by ordinary smoke-lifting plates.

It is admitted that the tests on the $\frac{1}{10}$-scale models in the Lelarge wind tunnel may depart from the conditions of service, particularly as regards ground effect, stationary wheels and motion work, and the limited length and air velocities of the wind tunnel. Extrapolation is required to extend the actual experimental data to the air speeds on the model which correspond to the running speeds of locomotives in service.

The extrapolation of results is based on the contention that the resistance is substantially proportional to the square of the air velocity beyond 30 metres per sec. (67 m.p.h.). On this basis, the experimental data were extended to a wind tunnel velocity of 400 metres per sec., corresponding to 40 metres per sec. (89·5 m.p.h.) in the case of the actual locomotive. The investigation covered the cases of running in calm air or a direct headwind, and in side winds at angles up to 20 deg. with the axis of the locomotive.

Test Results

On the assumption that the air resistance is proportional to the square of the air velocity beyond 30 metres per sec. (67 m.p.h.), the factor C (Dynamometer drag in grammes / (Air velocity, metres per sec.$^{(2)}$) is a coefficient, the numerical value of which decreases as the streamlining of the locomotive is improved. The power absorbed by the actual locomotive running at V metres per sec. against a head wind of H metres per sec. (direct head wind, or the direct equivalent of a side wind as explained below is $\frac{CV\,(V+H)^2}{750}$ metric h.p.

From data in a report by L'Aérodynamique Industrielle, the average value found for C was 6·87 for the Etat Pacific locomotive without casing and 4·68 for the machine when streamlined. From the charts reproduced herewith, the horsepower absorbed by air resistance, when the locomotive is running at 33 metres per sec. (74 m.p.h.) in still air, is 338 h.p. without, and 230 h.p. with the stream-

Results of air resistance tests undertaken at St. Cyr on a model of a French Pacific locomotive (See article opposite)

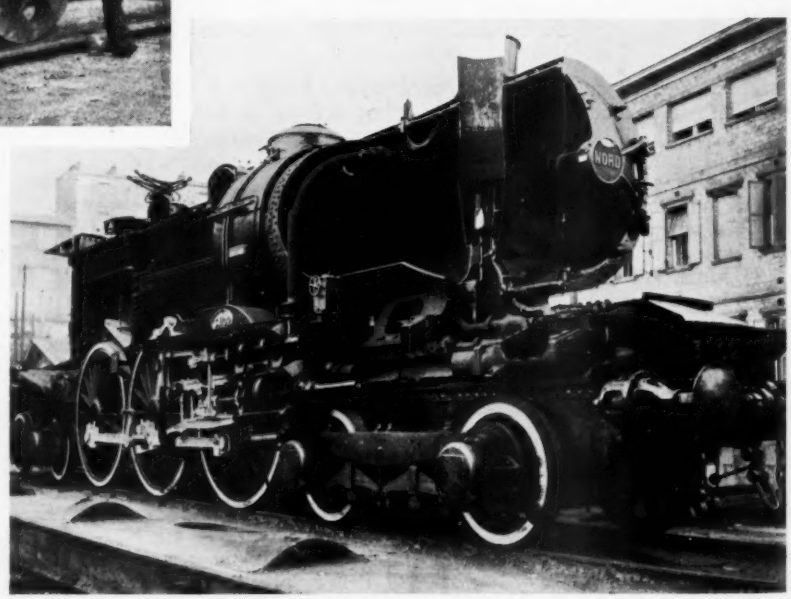
line casing, which thus effects a saving of 108 h.p. (106 h.p.). The values of *C* remain the same when the locomotive runs against a direct head wind, the effect of which is taken into account by the term *H* in the formula given above. Tests on models with intermediate degrees of streamlining gave values for *C* from 5·6 to 5·3.

In the tests, to determine the effects of an opposing side wind at angles α up to 20 deg. with the direction of running, readings were taken from axial and from fore and aft lateral dynamometers. Thence, curves were plotted which showed the air speed at angle α producing the same resistance as the actual speed of the locomotive in still air. This velocity was added to the side wind velocity and the corresponding total air resistance read from curves plotted for the purpose. In a particular case it was found that the Pacific locomotive, running at 30 metres per sec. (67 m.p.h.) against a wind of velocity 15 metres per sec. ($33\frac{1}{2}$ m.p.h.) at 10 deg. to the axis of the machine, experiences an air resistance of 554 h.p. without, and 392 h.p. with streamline casing, which thus saves 162 h.p. The lateral thrust on the rails is practically the same with and without the streamline casing. The resultant of the wind resistance in the direction of running and the component force perpendicular to the rails acts through a point practically on the axis of the locomotive and (for values of α up to 20 deg.) less than one-third of the length of the machine from the front.

From a special series of tests made to compare the efficacy and wind resistance of different smoke-lifting arrangements, it appears that the values of C were 5·80 for the Pacific locomotive without, and 6·87 with large-pattern smoke-lifting side plates of the type hitherto employed; compared with 5·5 for the locomotive partially encased but without smoke-lifter, and 5·3 for the machine with the A.I.-type (Aérodynamique-Industrielle) smoke lifter. Investigations with woollen threads showed strong marginal rising eddies with the old smoke lifting plates and relatively weak eddying with the A.I. equipment. Moreover, cinematograph films of test smoke emissions show that the A.I. equipment gave good vertical deflection, well maintained for the whole length of the locomotive, whereas the effect of ordinary lifting plates extends for only about two-thirds the length. The narrow horizontal smoke band formed by the A.I. lifter was little diffused or spread by a side wind and practically unaffected by cab eddies until it has passed the outlook plane.

The dimensions of the Lelarge wind tunnel appeared to be inadequate for conclusive investigation of the air resistance of locomotive and tender and complete trains. Further data obtained indicated the relatively greater reduction in resistance effected by adding a tender to the standard locomotive (*C* reduced from 6·87 to 6·5), than by adding it to the locomotive with streamline casing, *C* being then reduced from 4·68 to 4·6.

Left: A loaded coal tram of the type used in South Wales a century and a quarter ago for transporting iron ore. It is believed that, with the spread of the modern railway, this vehicle and its tramplates were transferred to the coal pits. This specimen was recently found in a pit disused since 1876 and has been presented to the National Museum of Wales (*see editorial note on page 522*)



Right: Four-cylinder compound 4-6-4 locomotive, No. 3.1102 Northern Railway of France, cut sectionally for showing at the forthcoming Paris Exhibition (*see Overseas notes, page 529*). *This locomotive was one of two built experimentally in 1912 and described in "The Railway Gazette" of June 7, 1912. It originally had a round-topped water-tube firebox whereas the other had an ordinary Belpaire firebox. When new they were the largest and most powerful express engines in Europe and were designed to haul 400-ton trains on the level at 75 m.p.h., a performance now easily accomplished by considerably smaller engines incorporating modern refinements*

120-FT. RAILS FOR THE L.N.E.R.

A consignment of 60 rails each 120 ft. long, now laid in the L.N.E.R. main line at Holme, south of Peterborough, is believed to be the first in the world of so great a length to be produced without welding. The methods of handling at the rolling-mill and when laying in the track are described in the article that follows

By CECIL J. ALLEN, M.Inst.T.

SOME exceptional problems in rail handling were successfully surmounted in the manufacture and laying of a batch of 120-ft. rails, which at the end of January last were rolled by the Skinningrove Iron Co. Ltd. of Saltburn-by-the-Sea, N. Yorks, to the order of the Southern Area, London & North Eastern Railway, and were laid in the down main line immediately south of Holme (69 miles from King's Cross) on February 21. Hitherto the only method of producing rails of such a length or longer has been by welding, and, as mentioned in an editorial note in the January 29 issue of THE RAILWAY GAZETTE, these are believed to be the longest rails ever yet produced in one piece from a rail-mill. The section of rail was the 100 lb. per yd. bull-head, slightly revised from the British Standard profile, in such a way that the web and foot are identical with the 95R section; this means a reduction of $\frac{1}{32}$ in. in the depth of the foot, which is transferred to the head, so enabling the 100R section rails to be used in the 95R standard chairs, and at the same time giving increased wearing capacity. Each 120-ft. rail, at the calculated weight of 99·84 lb. per yd., weighed 1 ton 15 cwt. 2 qr. 18 lb., or just over $1\frac{3}{4}$ tons. It was the combination of weight with extreme length, and the flexibility of rails of such length, which is apparent in the photographs reproduced, that made the matter of handling one of unusual difficulty.

No problem was presented by the rolling of the rails as the 3-ton ingot customarily used, which weighs 3 tons 6 cwt., rolls out to a little over 200 ft. of rail, and with the usual allowance for the top and bottom crops cuts into three 60-ft. or two 90-ft. lengths. In this case one 120-ft. and one 60-ft. rail were cut from each ingot; these were then skidded from the hot-saw on to the cooling bank, and by reversing the order of cutting with each successive ingot (120-ft. and 60-ft., then 60-ft. and 120-ft., and so on), the 120-ft. rails were brought together in pairs, separated by a pair of 60-ft. rails end to end. By this arrangement the long rails were kept admirably straight while cooling, as is seen in Fig. 1, and the cooling was retarded as much as possible by thus standing the rails in a solid compact batch. At the Skinningrove works the overhead crane spanning the cooling bank has a span of 135 ft., and this proved the principal factor in the expeditious handling of rails of such length, for it enabled them to be transferred, without any manœuvring round obstructions, direct from the cooling bank to the straightening machines. Owing to its flexibility, a rail 120 ft. long, if lifted centrally, would camber to an excessive degree, and an appliance was specially made to assist in the lifting. This consisted of two 15-in. × 4-in. steel channels, 90 ft. long, riveted together back to back to form the equivalent of a 15-in. × 8-in. joist, and provided with seven chain slings at 15-ft. intervals. The weight of this appliance, which was suspended from the crane, was $4\frac{1}{2}$ tons, and as the crane capacity is 10 tons, it was not thought advisable to lift more than two 120-ft. rails at a time, as shown in Fig. 2.

Fig. 1—120-ft. and 60-ft. rails lying on cooling bank at the Skinningrove Iron Company's works

The rails were rolled on Friday, January 29, and transferred to the railbank on the morning of the following Sunday, and as the rails took up the full width of the gantry, it was necessary for their manipulation to clear that portion of the railbank entirely. Four extra rail-benches were erected, and numerous extra rollers installed, to ensure that the rails should be fully supported through-

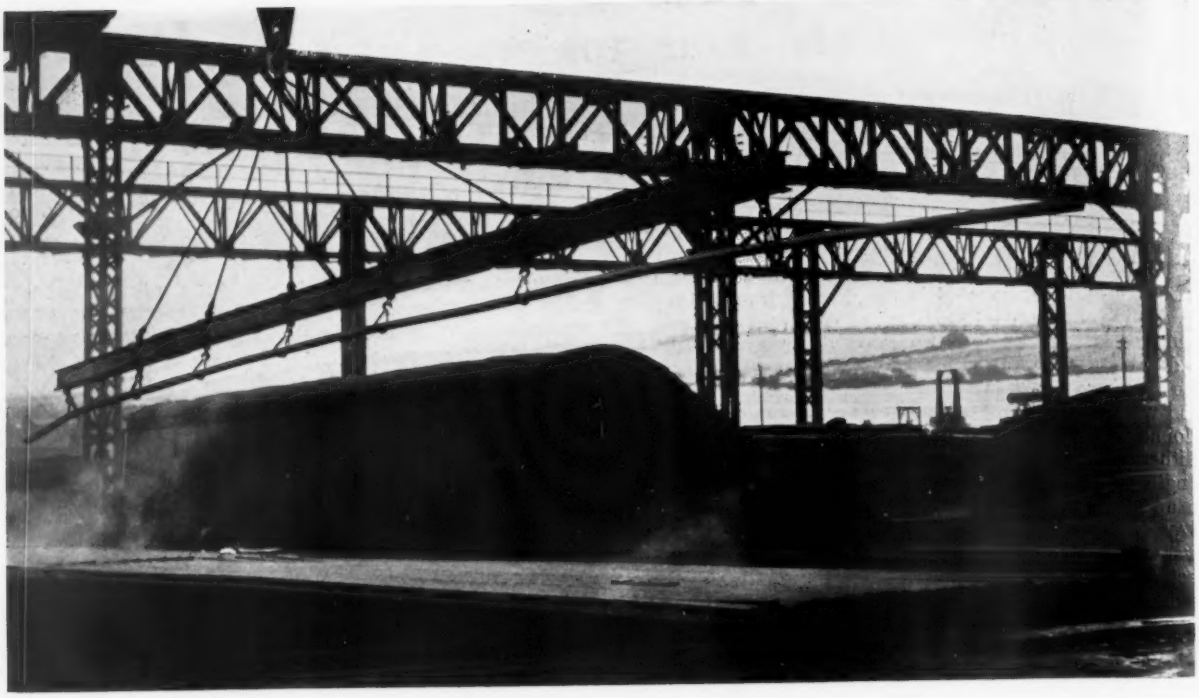


Fig. 2—Special 90-ft. lifting appliance for carrying 120-ft. rails from cooling bank to straightening machines at the Skinningrove Iron Company's works

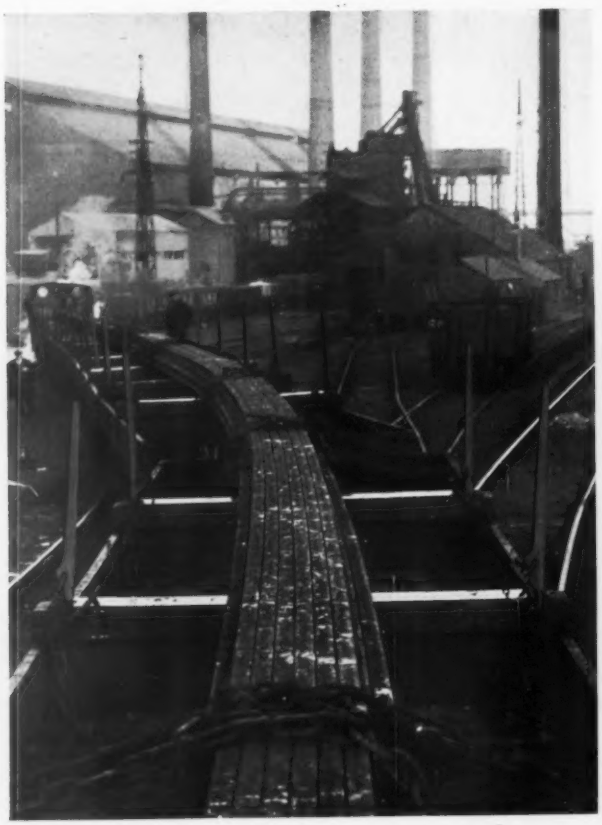


Fig. 3—Load of 120-ft. rails passing round curve in works sidings

Fig. 4—Unloading rails on site near Holme, L.N.E.R. main line

Photo.] *Fig. 5—Lifting one of the 120-ft. rails on site with eight portable rail-lifters* [C. C. B. Herbert

out their length, while being moved from the straightening presses to the ending and drilling machines, and from there to the inspection bank. The shelter over one of the ending machines (which end the rails to exact length by planing action) had to be dismantled, and that over the other partially so, to enable the rails to be passed from one machine to the other, and a certain amount of excavation of a tip on the far side of the bank was also required in order to give room to manœuvre the rails back to one of the drilling machines. These movements, which had been carefully planned to get the rails past various fixed obstructions on the bank, were carried through without a hitch, and they were finally pushed by hand on to the inspection bank. In order to avoid having to turn the rails over on the inspection bank, or to handle any of them back to the straightening presses for breaking down if defective, arrangements had been made to complete the surface inspection before any work had been done on the rails, and the only inspection remaining was for straightness and length. The appearance of the rails on the bank, immediately before loading, was excellent, the straightening being unexceptionably good. Final inspection took place on Tuesday, February 9, and loading on the following day.

There were 60 rails in the consignment, and they were loaded in four batches of 15 rails, each batch on two quintuple bolster wagons, with single bolster runners at each end. Each pair of quintuple wagons was close-coupled, and the bolsters had been removed from the inner ends, leaving each wagon with four bolsters. The rails stood on the bolsters head up in two rows, with nine in the lower and six in the upper row. Each load was secured by chains at two points only, one bolster on each quadruple wagon being prepared by raising its level with a 9-in. × 1½-in. timber strip; the remaining six bolsters were faced with 9-in. × ½-in. steel flats, well greased, to permit the rails to slide laterally when the sets passed round curves. This method of loading proved quite satisfactory, and no difficulty was experienced in working the loads round the sharpest curves in the works yard, as shown in Fig. 3, nor in transit from the adjacent Carlin How yard of the L.N.E.R. to Peterborough. The loaded sets passed out of the works on February 10 and 11, and unloading on site, 7¼ miles south of Peterborough, took place on Sunday, February 14, when possession of the up main line had been obtained.

Unloading was performed by the usual method of drawing the rails in pairs off the wagons. For this purpose a length of single chain is wrapped at one end round the running rails of the track and hooked in the centre, while at the other end it is extended by two short chains attached to a joggled bar, which engages in the end bolt-holes of a pair of rails. The rail train is then slowly moved forward, and the rails gradually slide off the wagons; with this consignment the drawing off was facilitated by the greased steel flats on which the rails rested. Five men were engaged on the ground in fixing the pull-off chains and engaging and disengaging them from the rails; and eight men on the wagons for unchaining the rails and turning them over on their sides. The entire job of unloading the 60 rails took from 7.15 to 11.5 a.m., but included a meal interval, several brief stoppages while trains passed on the down road, and one or two unavoidable minor delays. The average interval between each forward movement of the rail train was 6¼ min., but with allowance for the stoppages this figure was 4⅓ min. only, and several pairs of rails were unloaded in as little as 3 min. per pair. The longer intervals were chiefly when rails had to be shifted to a suitable position on the bolsters before the

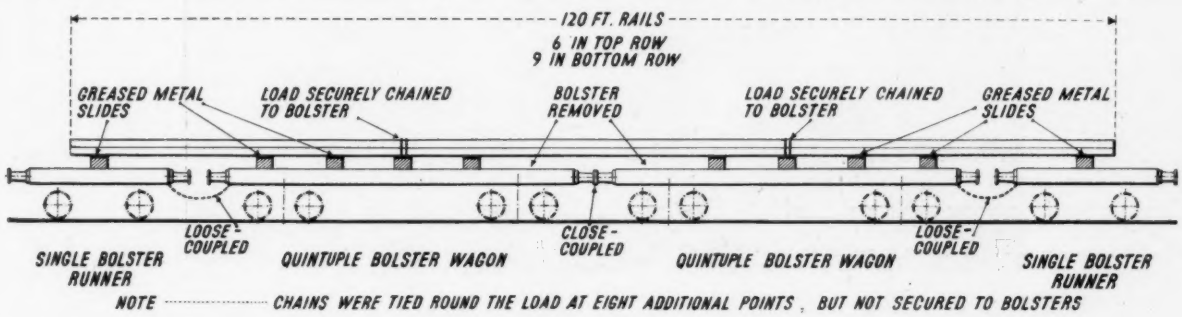


Fig. 6—Method of loading 120-ft. rails for transport

chains were attached. Fig. 4 shows the unloading operation, and illustrates the extreme flexibility of rails of so great a length as this. In the foreground it is seen that the double curve produced by the flexure of the rails has entirely straightened out as they take their bearing on the sleepers.

It was decided at the same time to shift the rails from the four-foot of the up main line, into which they had been unloaded, to the six-foot between the tracks, in readiness for the following week's relaying operation. A second gang of men was therefore in attendance, equipped with portable tripod rail-lifting appliances, which are stood on the sleepers, and grip the rails under the head, as shown in Fig. 5. Eight of these rail-lifters were in use, each manned by two men, and two more men were stationed at opposite ends of the rails to turn them up for the clips to be engaged. Swinging the rails from four-foot to six-foot at first took 6 min. per pair, but the time was soon reduced to 4 min. per pair, and gradually the second gang caught up and then kept pace with the unloading. Including inspector and timekeeper, 33 men in all were engaged in unloading and moving the rails, together with flagman and guard for the rail train.

Complete relaying of the down line began at 6.30 a.m. on the following Sunday, February 21, and began with the usual procedure of unfishing, knocking out keys, turning out and throwing clear the old rails, carrying out the old sleepers, and laying the new chaired sleepers in place. At 9.30 a.m. all was in readiness for getting the rail-lifting appliances in position, and by 9.50 a.m. the first rails were in position in the chairs. Eight rail-lifters were again in use, manned by 16 men, with two men at the ends of the rails turning them up; and owing to a very strong wind blowing across the track, it was found necessary to use another two men with bars to check the swing of the rails when lifted. With a ganger squaring the joints, and a man inserting the expansion distance pieces between the rails, 22 men were thus at work. The average time of inserting a pair of 120-ft. rails in the chairs was gradually reduced from an average of $4\frac{3}{4}$ min. to $3\frac{1}{4}$ min., and in several instances the time was as short as 2 min. The entire operation of installing the 60 rails, including several brief stoppages while trains passed on the up road, was 1 hr. 55 min.; the work was finished at 11.45 a.m., and the ballast train with 26 wagons of slag was pushed over them at 12.30 p.m. Comment was made on the good appearance of the rails even before they had been pulled finally into line. By Thursday of the following week the speed restriction had been taken off. In order to reduce creep, 16 Phillips anchors have been provided for each rail, spaced at 7-ft. 6-in. intervals.

This section of the L.N.E.R. main line is at the foot of Abbotts Ripton bank, which for $4\frac{1}{2}$ miles is inclined at 1 in 200, and at this point the speeds of down express trains are normally high. On Monday, March 1, eight days after the rails had been laid in, the writer passed over them in the Silver Jubilee at a speed of 92 m.p.h., and the riding of the train here was perfect. Congratulation is due to the Skinningrove Iron Company, which, incidentally, was the first British railmaking firm to produce 90-ft. rails, for the success with which the manufacture of this longer length has been inaugurated, so creating a world record; and to the staff of the District Engineer, King's Cross, for the expeditious manner in which the work of unloading and laying in was tackled, both operations being completed well within the time that had been allowed.

The Byrom Cup, L.M.S.R.

Sir Josiah Stamp presenting the L.M.S.R. "Byrom Cup" to Mr. J. H. Robinson, Divisional Superintendent of Operation, Manchester (*see report on page* 549)

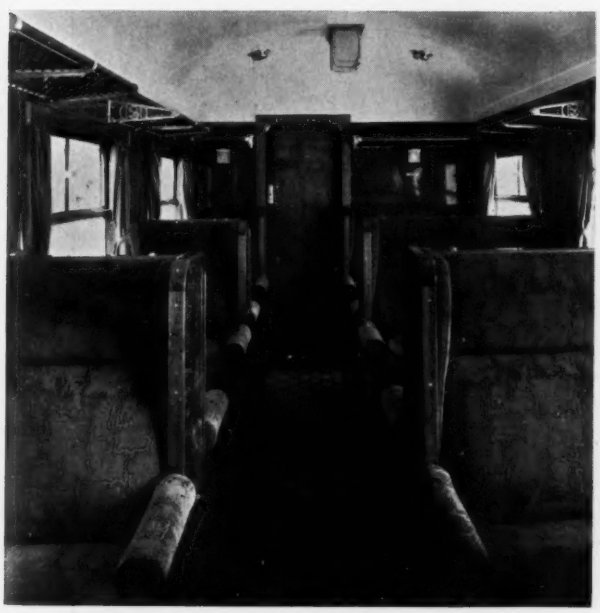
NEW ARTICULATED TRAINS FOR LONG DISTANCE EXCURSION TRAFFIC, L.M.S.R.

Eleven trains aggregating 110 vestibuled centre gangway welded coaches are being built at the company's works, Derby

AS was stated in THE RAILWAY GAZETTE of January 8, the L.M.S.R. programme of coaching stock renewals for 1937 includes the provision of 143 vehicles, comprising 110 vestibuled and 33 non-corridor coaches, in which the principles of articulation and of welded construction have been adopted. These afford substantial economies in weight, and consequently in building, maintenance and haulage costs. Representatives of the technical press were invited to visit the Derby works on Thursday, March 11, to inspect the new vehicles, special accommodation being provided for them on the 8.25 a.m. train from St. Pancras. Upon arrival at the works the party was conducted through the various shops in which the new stock was building, the different stages of construction being followed with interest, especially the welding operations on the sides, roofing and other parts. A completely assembled train was also shown, and every facility given for making a thorough inspection of the train and its appointments.

View through one of the new trains with third class seats in the foreground

The new vehicles are assembled to form eleven, 10-coach, articulated trains of centre corridor vestibuled stock, specially designed for long-distance excursion traffic. They are built to the requirements of Mr. W. A. Stanier, Chief Mechanical Engineer. The other articulated stock to be built under the 1937 programme comprises 33 non-corridor passenger coaches arranged in 3-coach units. As the drawing reproduced herewith shows, the trains for excursion traffic are articulated in 2-coach units comprising: two 2-car units each comprising third class brake (44 seats) and one vestibule third (56 seats); two 2-car units each comprising two vestibule thirds (56 seats each); and one 2-car unit comprising one third vestibule (56 seats) and one composite vestibule (18 firsts, 31 thirds). The total accommodation of each 10-car train thus amounts to 18 first class and 511 third class seats.

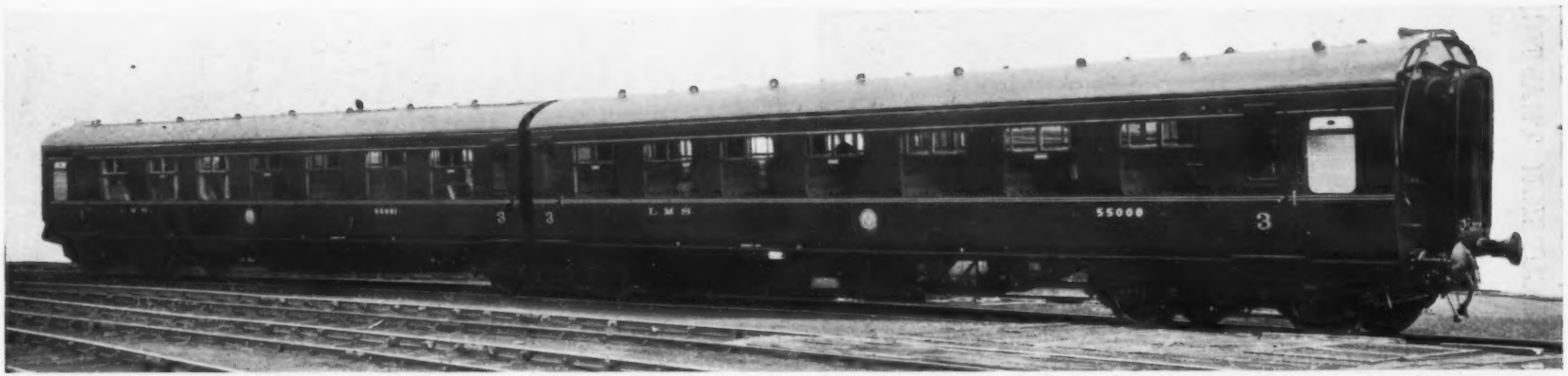


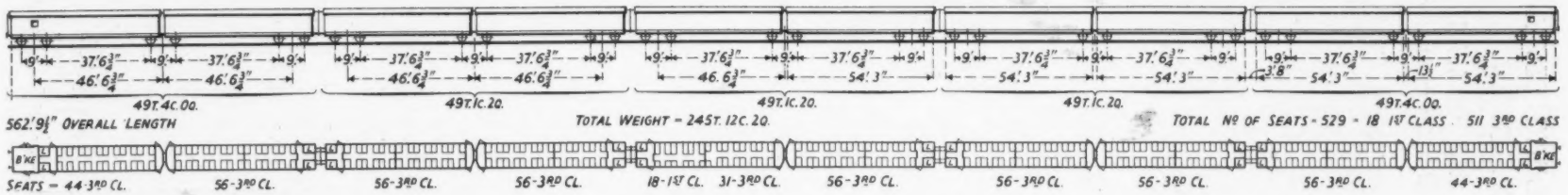
Interior of first class compartment

Important constructional features include the use of high tensile steel, and the building of the body integral with the underframe so as to provide one structure, instead of, as is usually the case, as a unit separate from the underframe. The extent to which the articulated trains afford economies in weight and length as compared with similar stock of standard design is shown by the following examples:—

Weight of 10 standard 57 ft. vestibule cars: 300 tons.
Weight of 10-coach train of articulated vestibule stock (5 articulated sets of two vehicles per set): 245 tons.
Saving per 10-coach train: 55 tons.
Weight per foot run of vehicles including underframe but excluding bogies:—
Standard vehicles: 7 cwt. per foot run.
Articulated vehicles: 6 cwt. per foot run.
Weight per passenger (including bogies):—
Standard vehicles: 10·42 cwt.
Articulated vehicles: 9·26 cwt.
Overall length of train over buffers:—
10 standard 57 ft. vestibule cars: 606 ft. 8 in.
10-coach articulated train: 566 ft. 6 in.

The design of the body and underframe is arranged so that the solebars and cantrails are combined as one mem-

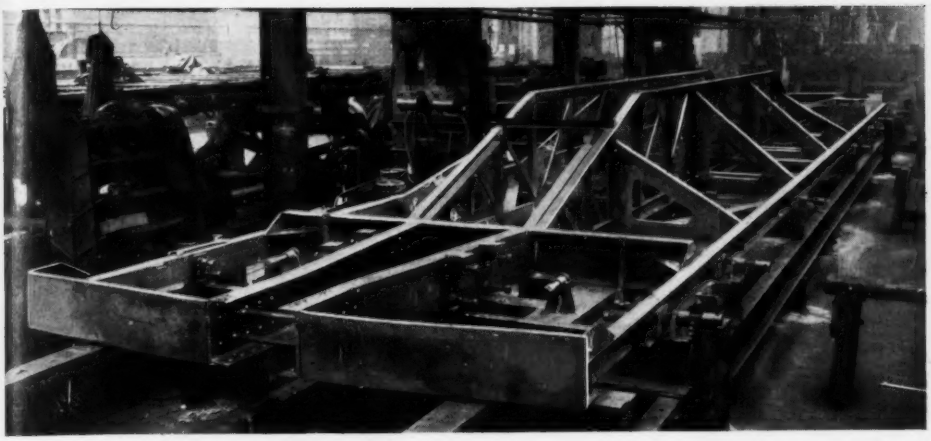




Above, articulated two-coach unit; and below, arrangement of complete 10-coach train in elevation and plan

Underframe showing centre coupling casting and side friction blocks

Centre bogie of articulated unit



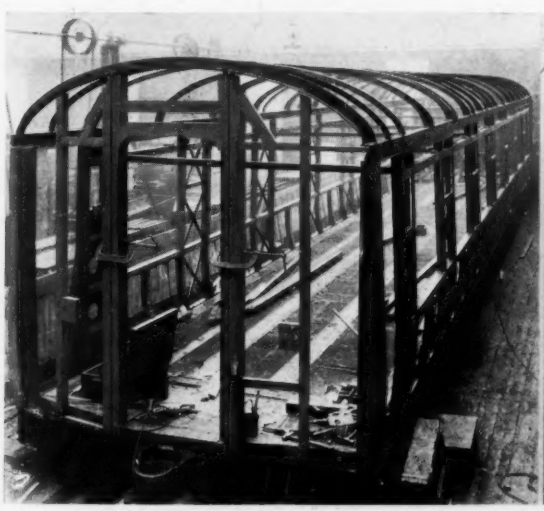
Welded articulated underframe on ramp in inverted position

ber, and the trussed longitudinals as another. The former members are of high tensile steel, channel section, and welded to them are steel sockets into which the body pillars are fitted and secured by steel pegs. Between the quarters the pillars are reinforced by steel bracings. The remaining members of the underframe are mild steel; the whole of the underframes is welded. Standard draw and buffing gear is fitted at the outer ends of each twin set, and the inner ends are articulated on one bogie on the Gresley principle. The bogies are constructed of mild steel, welded throughout.

The roof panels are of $\frac{1}{16}$-in. galvanised steel sheets, and the body side panelling $\frac{1}{16}$-in. steel, charcoal finish. The body side panels, welded throughout, are secured in one piece to the framing pillars by screwing. The roof sheets are welded in position to the roof members, which latter are also of light construction and secured to the cantrails by welding. The corrugated floor sheets are welded directly to the underframe members and covered with cork, on top of which lino is laid. The space between the body side and roof panelling and the interior finishing is ventilated to allow a through current of air in order to eliminate condensation.

The interior decorations for the first class compartments in the composite vestibule cars of these trains has been carried out in flush panelled dappled mahogany. The trimming material is an uncut moquette of a neat design in pastel shades, with curtains and carpet to tone. The decoration in the third class cars is carried out in different veneers, the vehicles being so marshalled as to give a uniform finish. Canadian betula, paldao, figured sapeli and walnut from West Africa are the finishes used. The panelling is flush throughout. The trimming materials are uncut moquettes of modern design. Centre runner carpets are provided. The metalwork finish of the first and third class compartments is satin matt silver and oxidised venetian bronze respectively, throughout the train. The lavatories are of modern design, and the walls are finished in green-grey paint with an eggshell finish. Hot and cold water is provided.

Electric lighting is by means of the Wolverton system, each coach carrying a self-contained axle-driven equipment comprising a dynamo, regulator and battery. Excepting the dynamo, where weight is necessary to ensure a satisfactory drive, the tare of the equipment has been reduced as much as possible. Aluminium is largely used for the regulator and control gear, and the 280-ampère-hour battery is composed of 12 Stone's No-Wash cells in moulded ebonite boxes. The main lighting is by ceiling fittings, each utilising two 60-watt lamps, and provided with Nacrolaque panels to screen the lamps from the eyes of passengers. Electric bell communication is provided throughout, and also through-control so arranged that the lights throughout the train are under the control of the guard, with facilities for individual control of all coach units. General excellence of design, appointment and finish is standardised throughout the whole of the construction.



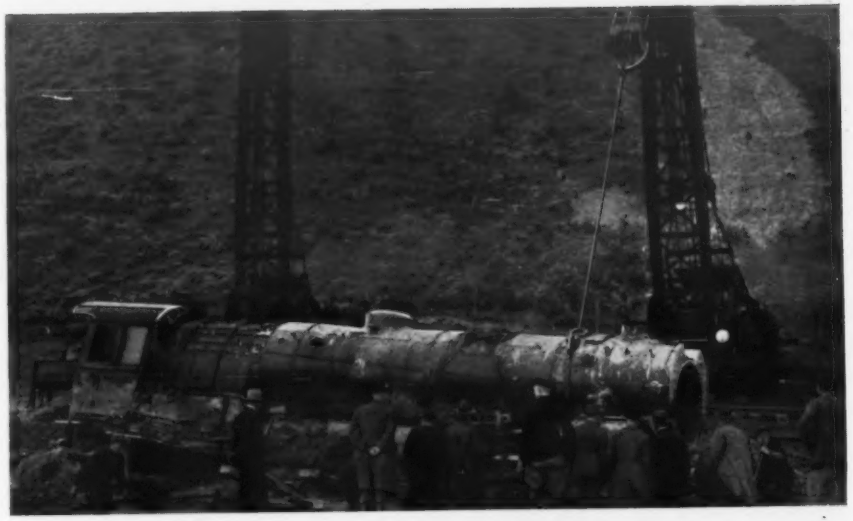
Completed body framework

Erecting and fitting roof panels

Underframe showing centre coupling casting and side friction blocks

Centre bogie of articulated unit

First crane in action, righting the locomotive



Drawing in front end parallel with the track

Both cranes lifting engine on to track

One of the cranes in running order

BREAKDOWN CRANES RERAILING CAPSIZED "K" CLASS 4-8-4 LOCOMOTIVE, NEW ZEALAND GOVERNMENT RAILWAYS

(See Overseas paragraph on page 530)

RAILWAY NEWS SECTION

PERSONAL

We regret to record the death, on March 12, of Mr. J. S. Anderson, Secretary and Treasurer, London Passenger Transport Board. He was born in 1888 and educated at Radley. He became Assistant Solicitor to the Metropolitan Railway early in 1914, but enlisted on the outbreak of war in the U.P.S., 18th Battalion of the Royal Fusiliers, was commissioned into the Queen's (Royal West Surrey) Regiment, and later transferred to the Flying Corps. He was appointed Chief Legal Adviser and Solicitor to the Metropolitan in 1929, and in 1931 became General Manager of that system. He carried on the duties of Chief Legal Adviser and Solicitor in addition to those of General Manager until his appointment as Secretary and Treasurer to the London Passenger Transport Board when it was formed in July, 1933. Mr. Anderson held the rank of Lieutenant-Colonel in the Engineer and Railway Staff Corps, and was a Member of Council of the Institute of Transport. (See editorial note on page 521.)

Elliott] [& Fry

The late Mr. J. S. Anderson,

Secretary and Treasurer, London Passenger Transport Board, 1933-37

Mr. H. M. Proud, Chief Commercial Engineer, Westinghouse Brake & Signal Co. Ltd., who, as announced in our issue of January 1, was then nominated by the council as President of the Institution of Railway Signal Engineers, recently assumed that office. He was educated at the High School, Brentwood, Essex, and in 1898 became apprenticed to the Scientific Appliance Company. During 1902-3 he was engaged upon electrical engineering work, first with the London United Tramways and then with the Central London Railway. Between 1904 and 1907 he held various railway signalling positions, eventually as an inspector on the London Electric Railways, in connection with the installation of the new automatic and power signalling on the Metropolitan District; Baker Street and Waterloo; Great Northern, Piccadilly and Brompton; and Charing Cross, Euston and Hampstead lines. In 1907 Mr. Proud joined the staff of McKenzie & Holland, Limited, to supervise the construction of power and automatic signalling plant on the Metropolitan Railway between Praed Street and Aldgate; later he also supervised further installations on that and on the East London Railway. In 1914 he was transferred to the office staff of the McKenzie, Holland & Westinghouse Power Signal Co. Ltd. in charge of estimating and construction work, and in 1916 was appointed Signal Engineer to that company. It was in 1932 that Mr. Proud was appointed Chief Commercial Engineer to the Westinghouse Brake & Saxby Signal Co. Ltd. He joined the Institution of Railway Signal Engineers in 1915, became a Member three years later, and has been a Member of Council for the past 16 years. He is also an Associate Member of the Institution of Electrical Engineers and has served on the Informal Meetings Committee of that institution. During his professional career Mr. Proud has been associated with the majority of the more important signalling installations in this country, in the British Dominions and in South America, and has travelled extensively abroad in connection with the activities of his company. He served on the committee of the I.R.S.E. which reported in 1924 on three-position signalling, as well as on various sub-committees of the British Standards Institution, in particular taking a very active part in connection with the standardisation of symbols for railway signal circuits.

Elliott] [& Fry

Mr. H. M. Proud,

Elected President of the Institution of Railway Signal Engineers, 1937

Mr. C. P. Parker, B.Sc., M.C., who, as announced in our issue of February 5, has been appointed District Engineer, Cambridge, L.N.E.R., was educated at Bancroft's School and East London College (University of London), where he took his degree of B.Sc. (Engineering). He joined the service of the former Great Eastern Railway in 1910, but at the outbreak of the war in 1914 he enlisted in the London Rifle Brigade. Mr. Parker subsequently received a commission in the Royal Engineers, in which corps he served with electric lights and field companies, and finally as Adjutant, R.E., 6th Division. He was awarded the Military Cross in 1918, and at present holds the rank of Captain in the 150th (L.N.E.) Railway Construction Company, R.E. (S.R.). On demobilisation in 1919, Mr. Parker returned to the Great Eastern Railway in the Signal Section of the Engineer's Department. In 1922, however, he was transferred to the District Engineer's office at Stratford, as a technical assistant, and was appointed Chief Assistant in that office in 1926, the position he now vacates to go to Cambridge as District Engineer, London & North Eastern Railway.

Mr. C. P. Parker, B.Sc., M.C.,

Appointed District Engineer, Cambridge, L.N.E.R.

(See Overseas paragraph on page 530)

Mr. J. S. Nicholas, who, as announced in our issue of March 12, is retiring this month from the position of Steelwork Assistant to the Chief Engineer, G.W.R., joined the staff of Westwood Baillie & Co. Ltd., Millwall, in 1886 at the age of 14, as drawing office apprentice; the firm was then engaged principally on large bridgework contracts for India, and such other structural work as dock gates, sheds, and buoys. During a seven years' apprenticeship he received technical training, in the evenings, at the City & Guilds College, Finsbury, and the East London Technical College, Bow. At the age of 21 Mr. Nicholas obtained the post of Steelwork Assistant to the Chief Engineer of the Highland Railway, and held it for six years, being responsible directly to the Chief Engineer for the design and construction of the steel bridges, and other steel structural work on that railway, now part of the L.M.S.R. system. In addition, he was concerned with the maintenance of the iron and steel bridges on that railway, and has always prized very highly the experience so gained. After resigning this post, he had experience as manager of a small engineering concern in the north of Scotland, and later as Chief Assistant to the late Mr. F. Gleadow, M.Inst.C.E., a consulting engineer in Westminster engaged principally on bridgework for the G.W.R. Mr. Nicholas joined the Great Western Railway in January, 1901, as a senior draughtsman under Mr. H. Deans, then Iron & Steelwork Assistant to Mr. (later Sir James) Inglis, and has been engaged continuously in that department ever since. He became Chief Assistant to Mr. A. C. Cookson in 1922 and succeeded him as Steelwork Assistant to the Chief Engineer in May, 1924. He retires on March 21, on reaching the age of 65, and we wish him future health and happiness.

Mr. J. S. Nicholas,
Steelwork Assistant to the Chief Engineer, G.W.R., 1924–37

Mr. G. R. G. Sargent,
Appointed Steelwork Assistant to the Chief Engineer, G.W.R.

Mr. C. H. T. Morgan.
Appointed Assistant to the Chief Engineer, G.W.R.

Mr. G. R. G. Sargent, M.I.Struct.E., who, as announced in our issue of March 12, has been appointed to succeed Mr. J. S. Nicholas, as Steelwork Assistant to the Chief Engineer, G.W.R., commenced his engineering career as pupil to the now defunct firm of Edward Finch & Company, Chepstow, builders of bridges, ships, and dock gates. In 1904 he joined the Chief Engineer's staff of the Great Northern Railway of Ireland for work on the reconstruction of bridges and stations. Mr. Sargent was responsible to the Chief Engineer for the design, inspection of material, and the schemes for erection of the work. While in Ireland he was appointed instructor in railway signalling to the staffs of the three principal Irish Railways. In 1915, having volunteered and failed to join H.M. Forces, Mr. Sargent was engaged by the Admiralty as steelwork specialist for the design of airship sheds, at that time the largest steel framed buildings ever built. Four years later he was transferred to the Air Ministry when that service took over control of airships, but upon the Government's decision to abandon airships he was offered, and accepted, in 1921, a three years' tour in Egypt as Section Officer for the maintenance and rebuilding of aerodromes in the Middle East. On completion of the tour in 1924, Mr. Sargent joined the Bridge Department of the L.M.S.R. at Crewe, but left that company in 1926 to join the Chief Engineer's staff at Paddington; he is a Member of the Institution of Structural Engineers.

Mr. C. H. T. Morgan, who, as announced in our issue of March 12, has been appointed Assistant to the Chief Engineer, G.W.R., began his career in the Chief Engineer's office of the Alexandra (Newport and South Wales) Docks and Railways, and remained at Newport Docks after the amalgamation and until 1926. He was then transferred as Assistant to the Resident Docks Engineer at Cardiff, and, on the formation of the Eastern Docks Division—comprising Newport, Cardiff, Barry and Penarth docks—he became Resident Assistant in charge of Cardiff Docks. It was in 1932 that Mr. Morgan was appointed Chief Assistant to the Divisional Docks Engineer at the Eastern Ports, the position he now vacates to go to Paddington as Assistant to the Chief Engineer.

We regret to record the recent death, at the age of 82, of Signor Riccardo Bianchi, who was General Manager of the Italian State Railways from 1905 to 1915. Born in 1854 and son of an officer in the Corps of Engineers, he studied engineering at Bologna and Turin prior to serving for a time with the then well-known firm of J. Penn & Co. Ltd., marine engineers, of Greenwich. He was afterwards appointed to the Upper Italy Railway and there organised a Signal Department for which he specially trained the personnel. Among his ablest assistants was Cardani, the designer of the rotary lock-a-block apparatus still in general use in Italy. In 1833 Bianchi, who had had experience with hydraulic power, invented the hydraulic signalling system which soon became widely used in Italy—and to some extent in other countries also—until in 1934 there were no fewer than 13,469 hydraulic levers in use in his own country. In 1891 he was transferred to the Traffic Department, and the experience he then gained together with his

eminence in the various forms of railway engineering qualified him for promotion as General Manager in 1905: he retired in 1915. An editorial on page 525 deals with his hydraulic signalling system.

Mr. A. Dunbar and Mr. A. B. Winder, Directors of English Steel Corporation Limited, have been appointed to the board of Vickers-Armstrongs Limited.

From *The London Gazette* of March 12: Regular Army Reserve of Officers: Movement Control Staff (Railway and I.W.T.):—

Major F. H. Sheat, having attained the age limit of liability to recall, ceases to belong to the reserve (March 13).

Capt. A. Hastie resigns his commission (February 18).

INSTITUTION OF CIVIL ENGINEERS

Messrs. E. Baron, B.Sc.; B. P. Townsend, B.Sc., and B. W. Wilson, B.Sc., all of the South African Railways and Harbours, have been elected associate members.

Mr. A. Williams, A.I.C.A., has been appointed to succeed Mr. T. F. Brennan as Comptroller of Accounts; and Mr. L. J. Williamson, L.I.C.A., has been appointed Assistant Comptroller, Victorian Government Railways.

Mr. Williams has been in the Accounts Branch for over 47 years. In 1929 he reorganised and improved its bookkeeping methods, and two years later played a leading part in the amalgamation of the Accountancy and Audit Branches. In 1932 he evolved and introduced the district accounting system, now recognised as one of the most important developments of the branch, and one that has eliminated much costly duplication of work. He is a Licensed Companies' Auditor.

Mr. Williamson joined the branch in 1909, and from 1915 to 1920 was abroad with the A.I.F., holding a commission successively in the Light Horse, Camel Corps, and Flying Corps. In 1922 he was appointed personal clerk to the Comptroller of Accounts, and in 1931, as Special Officer to the Comptroller, he specialised in important financial work. He is now only 42 years of age, and his success and promotion have been outstanding.

We note with regret the death, on March 13, in America, of Dr. Elihu Thomson, the well-known electrical engineer and inventor, who, in association with Dr. Houston, founded the original Thomson-Houston Company. All the Thomson-Houston companies or subsidiaries were concerned with early railway electrifications, including that of the North Eastern Railway Tyneside lines. Dr. Thomson was born in Manchester in 1853, but migrated to the U.S.A. at an early age. Manchester University conferred upon him the degree of D.Sc. in 1924.

The Byrom Cup, L.M.S.R.

(*See illustration on page 542*)

In connection with the L.M.S.R. Operating Department "On Time" movement, a ceremony took place at Euston on March 11 when Sir Josiah Stamp, Chairman of the company, presented to Mr. J. H. Robinson (Divisional Superintendent of Operation, Manchester) the Byrom Cup, which trophy is presented annually by the Chief Operating Manager to the winning division in the Express Passenger Train competition. The cup has now been won two years running by the Central Division.

Mr. Byrom, in inviting Sir Josiah Stamp to make the presentation, emphasised the large extent to which the success of the Central Division was due to Mr. Robinson's personality in getting his "team" to work for him.

Sir Josiah Stamp referred to the success of the "On Time" movement on the L.M.S.R., and, reviewing the working of express passenger trains on the system during 1936, pointed out that had it not been for a spell of bad weather towards the end of the year, the Central Division would have scored more competition points for the whole year than was the case when it won the cup in 1935.

Mr. Robinson, accepting the cup from Sir Josiah Stamp, stressed the endeavour, enthusiasm and team-work of his staff throughout the Central Division, and mentioned that the division had won the cup two years running despite the fact that within this period its express trains had been accelerated by an aggregate amount of 15 hours a day. Less than one-ninth of the trains on the Central Division (which comprises the former Lancashire & Yorkshire Railway system, together with the former L.N.W.R. main line from Manchester to Leeds) were allowed 4-5 minutes for connections, while the greater proportion of trains on the division was not allowed more than 30 seconds for station duties.

Sir Josiah Stamp was supported at the ceremony by Mr. W. V. Wood (Vice-President), and, in addition to Mr. C. R. Byrom, by the following chief officers and representatives of the Operating Department:—

Mr. E. Taylor (Chief Accountant); Mr. W. A. Stanier (Chief Mechanical Engineer); Mr. S. J. Symes (Stores Supt.); Mr. W. K. Wallace (Chief Engineer); Mr. T. E. Argile (for Mr. Ashton Davies); Mr. S. H. Fisher (Asst. Chief Operating Manager); Mr. D. C. Urie (Supt. of Motive Power); Mr. L. F. Rowlandson (Supt. of Organisation and Staff); Mr. S. E. Parkhouse (Div. Supt. of Operation, Crewe); Col. J. H. Rudgard (for Mr. E. D. Grasett, Div. Supt. of Operation, Derby); Mr. J. N. Phillipps (Operating Manager, Glasgow). Mr. E. J. H. Lemon, Vice-President, was unfortunately unable to be present, having been unavoidably detained down the line in consequence of block failures due to the snowstorm.

L.M.S.R. Quota League Competition Presentations

On Wednesday afternoon last, Sir Josiah Stamp, President of the Executive and Chairman, L.M.S.R., presented the Quota League cups and shields, competed for annually by the staff of the L.M.S.R. Chief Commercial Manager's Department, to the winners for 1936. The presentation was held in the Shareholders' Room, Euston station, and Mr. Ashton Davies, Chief Commercial Manager, presided. He was supported by, among others, the following: Messrs. E. B. Fielden, Charles Ker, E. J. H. Lemon, W. V. Wood, W. A. Stanier, O. Glynne Roberts, C. R. Byrom, G. L. Darbyshire, S. J. Symes, A. F. Bound, G. H. Loftus Allen.

Mr. Ashton Davies, in opening the proceedings, expressed appreciation of the presence of Sir Josiah Stamp and Mr. Lemon, Vice President, Railway Traffic Operating and Commercial Section. After pointing out that the efforts of the staff had enabled the quota set for 1936 to be substantially exceeded, Mr. Davies called upon Sir Josiah Stamp to address the assembly.

Sir Josiah said that the results of the competition were being watched with interest both by the headquarters' officers and the board. It was undoubtedly proving most useful in making all ranks realise the value of solidarity. If a district was to win one of the trophies it was essential that every individual should play his part. It was noticeable that, whereas before the innovation of the quota competition the average railwayman displayed little interest in the weekly traffic returns, today they were being scrutinised by an ever-increasing number of employees. Sir Josiah said that he had asked Mr. Ashton Davies about the personal aspect of the quota system, and he had learnt that the competition had done much to capitalise the value of a smile and courteous attention. Finally, Sir Josiah, before presenting the trophies, expressed appreciation of Mr. Ashton Davies, whom he described as being the dynamo which provided the driving force.

The four cups for the inter-district competitions, which were the principal awards, were won as follow:—

Passenger League, Leicester District (Mr. D. S. Inman, District Goods and Passenger Manager).

Goods League, South West and Central Wales District (Mr. C. H. Tait, District Goods and Passenger Manager).

Coal League, Leeds District (Mr. J. E. Papworth, District Goods, Manager).

Port League, Garston (Mr. R. D. Roberts, Docks Superintendent).

After short speeches from the recipients of the four cups, Mr. E. J. H. Lemon, in a brief and humorous speech, expressed thanks to Sir Josiah Stamp and Mr. Ashton Davies.

R.M.S. "Queen Mary"—First Call at Plymouth

The first of four calls by the *Queen Mary* at Plymouth (after a run of 3,102 nautical miles in 4 days, 11 hr. 58 min. at an average speed of 28·73 knots) for the disembarkation of passengers last Monday, was made the occasion of a civic celebration by the Lord Mayor of Plymouth. Three further calls are to be made on March 29, April 12, and April 26.

In brilliant sunshine the *Queen Mary* arrived off Plymouth at 11.10 a.m. and the Great Western Railway's fleet of tenders *Sir Richard Grenville*, *Sir John Hawkins*, *Sir Francis Drake*, and *Sir Walter Raleigh*, were soon in attendance and the disembarkation of passengers, baggage, and mails was speedily effected. Whilst the disembarkation was taking place, Captain R. V. Peel received on board the Mayor of Plymouth, Alderman W. R. Littleton, and numerous other guests, when the Mayor extended to the liner a civic welcome.

Those present at the function included :—

Lord Morley, President of the Port of Plymouth Chamber of Commerce ; the Rt. Hon. The Earl of Mount Edgcumbe, a Director of the Great Western Railway Company ; Sir Percy E. Bates, Bt., Chairman of the Cunard White Star Company and a Director of the Great Western Railway Company ; Mr. S. J. Lister, General Manager and a Director of the Cunard White Star Company ; Captain S. J. Horsburgh, Marine Superintendent ; Mr. F. A. Derry ; Mr. Gilbert Matthews, Operating Superintendent, and Mr. G. E. Orton, Commercial Assistant to the Superintendent of the Line (Mr. Frank Potter), G.W.R. ; Mr. P. P. Spang (Office of Superintendent of the Line), Mr. E. W. Gould (Docks Manager, Plymouth), Mr. J. Thomas (Assistant Docks Manager, Plymouth), Mr. J. S. Pearson (Assistant District Traffic Manager, Plymouth), Mr. A. W. H. Christison (Divisional Locomotive Superintendent, Newton Abbot) ; Mr. R. A. P. Setterfield, Manager, Hotels and Refreshment Rooms Department.

All four tenders were alongside the ship between 11.20 and 11.30 a.m. and the baggage tender arrived back at the docks at 12.35 p.m., followed by the mail tender, at 1.5 p.m., the first passenger tender at 1.18, and the second passenger tender at 1.40 p.m.

The passengers landed numbered 351, and two special boat trains were standing on the G.W.R. lines adjacent to the dockside in readiness for the passengers and their baggage. The baggage was expeditiously examined by the customs authorities and the first special train left at 2.7 p.m. This train was formed of special saloons and a brake first and covered the 226 miles to Paddington in 3 hr. 51 min. The second train also gave a good performance, accomplishing the run in 4 hr. 5 min. with a much heavier load. Logs of the two runs are appended.

LOG OF FIRST SPECIAL TRAIN CONVEYING PASSENGERS OFF R.M.S. *Queen Mary*, MARCH 15, 1937

Stations	Point to point	Times			Min. point to point	Speed point to point
		arr.	pass	dep.		
	m. ch.	p.m.	p.m.	p.m.		m.p.h.
Plymouth Docks ..	— —	—	—	2.7	—	—
North Road ..	1 20	—	2.12	—	5	—
Ashburton Jcn. ..	23 28	—	2.41	—	29	48·3
Newton Abbot ..	8 38	2.53	A	2.55	12	42·4
Exeter	20 18	—	3.15½	—	20½	59·2
Taunton	30 60	—	3.45	—	29½	62·5
Castle Cary ..	27 45	—	4.9	—	24	69·0
Heywood Road ..	20 64	—	4.32	—	23	54·3
Bedwyn	28 12	—	4.57	—	25	67·6
Newbury	13 26	—	5.7	—	10	80·0
Reading	17 9	—	5.22½	—	15½	66·2
Slough	17 42	—	5.39	—	16½	63·7
Paddington ..	18 36	5.58	—	—	19	58·2
	226 78					

Average speed throughout : 58·9 m.p.h. A. Detaching assistant engine.

Formation of train : Engine No. 5016 *Montgomery Castle* (Driver Osborne of Laira) ; stowage van ; special saloon ; kitchen car ; 2 special saloons ; kitchen saloon ; special saloon ; kitchen saloon ; brake first.

Weight of train excluding engine : 326 tons.

LOG OF SECOND SPECIAL TRAIN CONVEYING PASSENGERS OFF R.M.S. *Queen Mary*, MARCH 15, 1937

Stations	Point to point	Times			Min. point to point	Speed point to point
		arr.	pass	dep.		
	m. ch.	p.m.	p.m.	p.m.		m.p.h.
Plymouth Docks ..	— —	—	—	3.5	—	—
North Road ..	1 20	—	3.10	—	5	—
Ashburton Jcn. ..	23 28	—	3.45	—	35	40.0
Newton Abbot ..	8 38	3.56	A	3.58	11	46·2
Exeter	20 18	—	4.21	—	23	52·7
Taunton	30 60	—	4.53	—	32	57·7
Castle Cary ..	27 45	—	5.17	—	24	69·0
Heywood Road ..	20 64	—	5.37	—	20	62·4
Bedwyn	28 12	—	6.5	—	28	60·4
Newbury	13 26	—	6.17	—	12	66·8
Reading	17 9	—	6.33	—	16	64·2
Slough	17 42	—	6.51	—	18	58·4
Paddington ..	18 36	7.10	—	—	19	58·2
	226 78					

Average speed throughout : 55·6 m.p.h. A. Detaching assistant engine.

Formation of train : Engine No. 5011 *Tintagel Castle* (Driver Wyburn of London) ; stowage van ; special saloon ; kitchen car ; special saloon ; 2 firsts ; restaurant car ; 1 first ; restaurant car ; 2 thirds ; brake third.

Weight of train excluding engine : 412 tons.

G.W.R. LONDON POSTER.—The popularity of last year's G.W.R. poster by Ernest Coffin, showing a bird's-eye view of the City from the Mall to Tower Bridge, has led the company to commission another of this type from the same artist. The area covered by the present poster is from Paddington station, on the horizon, to the Houses of Parliament in the foreground. A large portion of the Coronation procession route is therefore included, and the poster is assured of appreciation from all visitors to the capital owing to the large number of world-famous buildings and scenes portrayed. Westminster Abbey and Buckingham Palace, with the Royal Standard flying above it, are prominent, and a second standard beyond the Mall leads the eye to the palace of St. James. The flowers, trees, and watercourses of St. James's Park form an attractive central feature, and, with the beflagged buildings and bright sky, strike the note of welcome appropriate to the occasion.

BOY SCOUTS' CRUISE TRAIN.—At 8.15 p.m. on Sunday, April 11, 180 boy scouts will leave King's Cross for a week of open-air life in the Highlands of Scotland, in a cruising train consisting of 13 coaches to be hauled by the streamlined locomotive *Golden Eagle*, which later in the year is to haul the Coronation train. The train, which will be fully equipped with sleeping and feeding accommodation, will take them up to Banavie, near Fort William, and the boys will spend three days there devoted to climbing, walking, and outdoor activities, including a cruise through the Sound of Sleat. They will return to London by way of Aberfoyle, Newcastle, and York, and arrangements have been made for their cruise train to be worked very slowly over the Forth Bridge in order that the boys may have a full view of this famous structure. They will arrive back in London on Sunday afternoon, April 18.

Forthcoming Meetings

March 25 (*Thurs.*).—**Derwent Valley Light Railway Company** (Annual General), 16, Coney Street, York, at 3.0 p.m.

May 5 (*Wed.*).—**Canadian Pacific Railway Company** (Annual General), at the principal office of the Company, Montreal, at noon.

Retired Railway Officers' Society Luncheon

The Spring luncheon of the Retired Railway Officers' Society was held at the Liverpool Street Station hotel, London, E.C.2, on Tuesday, Lt.-Col. Sir Charles L. Morgan, C.B.E., R.E.(T) retd., President of the society, presiding. There was a large attendance of members and guests, as follows:—

Messrs. H. Adams, T. E. Argile, A. W. Arthurton, J. Ballantyne, A. R. Bell, W. Bingham, A. H. Bird, J. F. Bradford, F. S. Bridge, R. Brown, W. A. Brown, A. H. Bull, H. J. Burcham, H. R. Campfield, J. B. Carter, R. F. C. Castleman, A. L. Castleman, W. R. Charlton, G. J. Chesters, Major E. C. Cookson; Messrs. A. E. Cookson, G. Cole Deacon, C. M. A. Cooper, A. E. Dolden, A. Duffield, A. F. Dymant.

Messrs. H. Ferguson, J. F. Gee, E. A. Glazier, H. J. Guest, W. E. Hart, E. B. Hassall, E. L. Hawkins, C. G. Holland-Martin, H. J. Hoskins, W. H. Humphrey, T. W. Jacobs, Sir Francis L'Estrange Joseph; Messrs. J. A. Kay, D. R. Lamb, J. W. Lovejoy, D. McCulloch, Dr. MacMahon; Messrs. J. McLaren, E. W. Mauger, A. Maynard, A. S. Mills, Sir Charles L. Morgan; Messrs. G. Morton, C. H. Newton, R. H. Nicholls, E. E. Painter, F. K. Pelly, Major J. Petrie; Messrs. W. F. Pettigrew, J. Pike, F. R. Potter, O. Cecil Power, C. A. Roberts.

Messrs. H. E. Roberts, S. Roberts, E. Robinson, J. Roughton, R. Rowbottom, T. W. Royle, F. Ruffell, F. A. Sargent, T. H. Shipley, J. Procter Smith, S. V. Smith, T. Smith, D. Spooner, W. A. Stanier, G. Sutherland, M. C. Tait, E. Taylor, W. A. Thomas, Major W. E. Thornhill; Messrs. J. Tipton, J. C. L. Train, W. T. Venton, A. Walker, H. C. Walton, Sir Ralph Wedgwood; Messrs. A. W. Willet, J. Williams, J. S. Wilson, J. H. Woodhead, J. Yates.

Expressions of regret at inability to attend were received from:—

Sir Francis Dent, Sir Nigel Gresley, Sir Harold Hartley, Sir Robert Horne, Sir James Milne, Sir David Owen, Sir Josiah Stamp, Sir Herbert Walker; Messrs. C. R. Byrom, Ashton Davies, O. Glynne Roberts, Charles L. Hambro, E. J. H. Lemon, E. J. Missenden, Gilbert Szlumper, and G. G. Senior (ex-President of the society).

Sir Charles L. Morgan, after giving the loyal toast, proposed "The Guests." The society, he said, was happy to receive so many visitors of eminence. They had with them Sir Francis Joseph, and Sir Ralph Wedgwood, and he thought it exceedingly kind of them to find time to come to this meeting and add to the members' pleasure.

Sir Francis Joseph, replying to the toast, said that the members of the Retired Railway Officers' Society were now happily circumstanced. They had taken on a measure of retirement. But there were today so many changes in the foundations of society; so many imminent alterations in our social, national, and international structure, that members still had great opportunities of service. He did not believe there had ever been a time in the history of this country when the value to the community of experience and commonsense had been so great as it was today. Youth had its great urge; its passionate discontent against things as they are; its failure to notice how progressive things have been, and how great have been the improvements in our day and generation. It was for them, his hearers, to put the brake on and to guide. Should we ever be led towards political experiments that could only end disastrously, they, in so far as they could touch matters of local government and the direction of their fellows, would be conferring the greatest benefit upon the present generation and the generation to come.

Mr. J. Ballantyne, proposing "Success to the Retired Railway Officers' Society," said that it was a body which did a great work by helping its members to get together in friendly companionship, and maintain their interest in railway life today. The fact that some members were of twenty years' standing showed how much the society did in stimulating an alert interest in affairs.

Mr. O. Cecil Power seconded, and confessed that he was one of those who, while advocating road transport for others, preferred for himself the comfort and seclusion of a railway carriage. When he had told some of his friends in Birmingham that he was to be a guest of retired railway officers, they had compared him to Daniel in the lions' den; but he was pleased to say that he counted some of his greatest friends among the membership of the society.

Mr. J. F. Bradford responded for the society, paying a special tribute to the work of Mr. W. A. Thomas, its energetic Secretary.

Mr. A. Maynard proposed the health of "The President," thanking him on behalf of the gathering for the very pleasant way in which he had conducted the proceedings. The railway structure, he said, was safe because it had been built on sound foundations, and it was to the retired officers that the safety of the foundations was due.

Mr. A. H. Bull, seconding, said he was delighted to see Sir Charles Morgan in the chair, the first time, he believed, that any Southern Railway representative had occupied that position. He wished him every happiness during his year in office.

The President, expressing his thanks for the toast, pointed to the advantages of such a society as theirs, where they met not only each other, but those still in active service and looking after their interests on the railways.

Mansion House Association on Transport

The annual luncheon and general meeting of the Mansion House Association on Transport (Incorporated) were held at the Trocadero, Piccadilly Circus, W.1, on March 12. Sir Isidore Salmon, C.B.E., M.P., Chairman of the association's Parliamentary Committee, presided at the luncheon, at which Dr. Leslie Burgin, LL.D., M.P., was the principal speaker.

Sir Isidore Salmon welcomed Dr. Burgin, and also Sir Arthur Griffith-Boscawen, P.C., J.P., Chairman of the Transport Advisory Council. He emphasised the fact that the association dealt with a subject now prominently in the public eye.

Mr. W. H. Gaunt, President of the association, extended greeting to Sir Charles Stuart Williams (Chairman, British Railway Stockholders' Union); Mr. C. J. Selway (Chairman, Coaching Traffic Superintendents' Conference; and Passenger Manager, Southern Area, L.N.E.R.); Sir Charles Hipwood (Director, National Union of Manufacturers); and Lord Cork and Orrery (President, Coastal Trade Development Association). Mr. Gaunt, recalling that the Mansion House Association had been at work since 1882, proceeded to survey certain current topics affecting members' interests. Progress had been made in dealing with weak bridges, of which 2,096 were now condemned. Of these, 1,256 had been accepted for complete reconstruction; this work was already in progress in some cases, and the remainder would be dealt with in building programmes up to 1940. But there were still, in 1937, 840 weak bridges, regarding the reconstruction of which no agreement had been reached.

Dr. Leslie Burgin said he considered distribution to be one of the great problems of modern life, and therefore it was the vital concern of traders and industrialists to see that the most efficient transport facilities that brains could produce were available. Mr. Gaunt had mentioned the use of foreign coasting vessels to convey products which he thought we had a particularly strong claim to carry ourselves. The fact was that our Continental neighbours, particularly the Dutch, knew a good deal about our many shallow water ports, and had built a type of vessel specially adapted for such conditions. The remedy was not to bar the Dutch, but to build British craft of a similar type.

Sir Arthur Griffith-Boscawen said the Transport Advisory Council was now engaged in several important inquiries, among them being that of trying to establish some form of co-ordination between the various forms of goods transport in this country. Although his colleagues were agreed upon the merits of the principle, they had not yet got very far in practice.

Sir Patrick Hannon, M.P. (President, National Union of Manufacturers), proposed a vote of thanks to Dr. Burgin and Sir Arthur Griffith-Boscawen.

At the general meeting, which followed the luncheon, Mr. George Cadbury appealed for the freedom of the trader to choose the form of transport necessary for his industry. They must beware of encirclement by restrictive legislation. Col. Ralph Clarke was elected to the Parliamentary Committee of the association.

QUESTIONS IN PARLIAMENT

Overcrowding in Tube Trains

Wing-Commander Wright (Erdington—U.) on March 10 asked the Minister of Transport whether he was aware of the serious overcrowding in the London tube trains during the rush hours; whether he had considered the dangers in the event of fire or accident; and whether he would direct the attention of the London Passenger Transport Board to the necessity of immediately dealing with this state of affairs.

Mr. Hore-Belisha (Minister of Transport): The board has in hand an extensive programme of works to deal with the problem of the growth of London's traffic.

Freight-Carrying Charges

Mr. A. G. Walkden (Bristol, S.—Lab.) on March 10 asked the Minister of Transport whether the Traffic Advisory Council was giving active consideration to the question of the regulation of freight-carrying charges to ensure equality of rates and other conditions as between roadway and railway undertakings; and, if so, when the council might be expected to present its report on this subject.

Mr. Hore-Belisha: Yes, Sir, but I do not know when the investigations will be completed.

Live Rail Casualties on Southern Railway

Sir Frank Sanderson (Ealing—U.) on March 10 asked the Minister of Transport if he could state the total number of casualties on the Southern Railway caused through the live rail; and the number of fatal accidents for the years ended December 31, 1935 and 1936.

Mr. Hore-Belisha: Total casualties 1935, 45; 1936, 48. Fatalities 1935, 2, of whom one was a trespasser; 1936, 8, of whom 7 were trespassers.

Charing Cross Bridge

Mr. H. Day (Southwark, Central—Lab.) on March 10 asked the Minister of Transport whether he would give particulars of any decision that had been arrived at following the Committee's Report on Charing Cross Bridge.

Mr. Hore-Belisha: There has been no decision.

Supervision of Arms and Munitions

Mr. P. J. Noel-Baker (Derby—Lab.) on March 10 asked the Secretary of State for Foreign Affairs whether the British agent in control of the application of the non-intervention agreement in Portugal would receive the necessary facilities from the Portuguese authorities to enable him to supervise the movement of arms and munitions in Portuguese ports and railway stations and to control their transport to and from armament factories, arsenals, and other stores.

Mr. A. Eden (Foreign Secretary): Under the arrangements made with His Majesty's Government, the Portuguese Government has agreed to grant full facilities to the British observers in carrying out their duties, and will afford free access to, and examination of, all relevant localities, documents, and facts. The duties of these officers will be to observe the nature of goods and the number and nationality of travellers crossing the Portuguese frontier into Spain and to report to His Majesty's Ambassador at Lisbon such facts as may come to their notice. They will, therefore, be stationed, not at the ports, but at the Spanish-Portuguese frontier.

The observers, as Attachés to His Majesty's Embassy, will enjoy all usual diplomatic privileges. They will be at liberty to ask for information from the local authorities, including statements of clearances or passage of cargo and passengers. The observers will further be permitted to request the competent Portuguese authorities to take such steps as may be possible to verify or disprove fears that breaches of the Non-Intervention Agreement were being or about to be committed. The observers will also be at liberty to communicate freely among themselves and with His Majesty's Ambassador.

As I have stated, observation will be carried out on the Portuguese-Spanish frontier, and it is considered that the officers, who will be stationed at frontier crossings, in particular at railway stations and on major and secondary roads, will be in a position to establish all facts necessary for the proper observation of the application of the Non-Intervention Agreement.

Electrification and Through Running

Brigadier-General Clifton Brown (Newbury—U.) on March 15 asked the Minister of Transport whether his attention had been called to the different systems of electrification used by the Southern and the other railway companies in this country; and whether he was satisfied that in case of emergency there would be no difficulty in transferring engines and trucks from one system to another without unloading or delay.

Captain Austin Hudson (Parliamentary Secretary to the Ministry of Transport): As all main-line freight traffic is now hauled by steam, there will be no difficulty in the expeditious transfer of engines from one railway system to another, or in the transfer of freight without unloading. Regulation 7 of the Railway (Standardisation of Electrification) Order provides that as and when (owing to electrification) the proportion of one-third of the (steam) locomotives owned by any railway company, as at December 31, 1928, have been replaced by electrically-propelled stock, the Minister shall lay down to what extent electric locomotives belonging to that company shall be equipped, in accordance with standards set out in the regulation, so as to be capable of through running on other railways worked by a different method of traction.

Travelling Facilities on L.N.E.R.

Mr. Robert Morrison (Tottenham, N.—Lab.) on March 15 asked the Minister of Transport whether he was aware of the resolutions passed by local authorities and other organisations in North London complaining of the failure of the L.N.E.R. to take effective steps to improve travelling facilities upon the Liverpool Street to Enfield line; and would he represent to the company the urgency of giving this matter early attention.

Captain Austin Hudson: I sent the hon. member a letter on this subject on February 15.

Railway Development Programmes

Lieutenant-Commander Fletcher (Warwick, Nuneaton—Lab.) on March 16 asked the Minister of Transport if he was aware that the British Iron and Steel Federation had given notice to the railway companies that the price of steel would be raised after May 31; and what effect this rise would have upon development programmes already announced by railway companies.

Captain Austin Hudson (Parliamentary Secretary to the Ministry of Transport): The railway companies inform me that the matter is now being considered by them.

BARRANQUILLA RAILWAY & PIER CO. LTD.—Notice is given in *The London Gazette* of March 9 that the Order of the High Court of Justice, Chancery Division, dated February 22, 1937, confirming the reduction of the capital of this company from £656,250 to £600,000 was registered by the Registrar of Companies on March 5.

NORTHERN IRELAND TRAFFICS.—Passenger receipts for the first 11 months of 1936 on railways wholly in Northern Ireland amounted to £270,301, against £249,370 for the corresponding period of 1935, with an improvement in the number of passengers (apart from season ticket holders) carried. Merchandise and mineral tonnage for the 11 months advanced from 501,461 tons to 543,192 tons, and the total goods traffic receipts from £170,901 to £201,670. Railways partly in Northern Ireland carried 5,350,417 ordinary passengers in the first 11 months of 1936, against 5,442,618 in the first 11 months of 1935, but total passenger receipts improved from £407,763 to £425,409. For the complete year, 1936, railways wholly in Northern Ireland received £285,781 from passengers, an increase of £20,423 over 1935, and the total receipts from goods traffic improved from £188,071 to £217,977. Passenger receipts for the year 1936 on railways partly in Northern Ireland amounted to £455,078, an increase of £14,417, and total receipts from goods traffic were £625,825, against £623,289.

Railway Convalescent Homes Dinner

As the Railway Convalescent Homes are self-supporting, the object of the annual spring dinner is not to raise money but to bring to the notice of the directors and officers of the railway companies the work for railwaymen and women which the movement is doing, and so extend the sympathetic co-operation which has contributed so largely to the success of the homes.

This year the spring dinner was held on Friday last, March 12, in the Wharncliffe Rooms, Hotel Great Central. Sir Josiah Stamp, G.C.B., G.B.E., who has accepted the presidency for 1937 occupied the chair, and among the guests present were:—

Lady Stamp, J.P., Sir Harold Hartley, C.B.E., and Messrs. R. Carpmael, W. Challis, H. S. Chapman, O. H. Corble, A. Endicott, W. Every, C. E. Fairburn, A. Hammett, T. M. Herbert, J. F. Lean, W. E. C. Lazenby, D. V. Levien, J. Marchbank, George Mathers, M.P., G. Orton, E. E. Painter, R. Riddles, V. A. M. Robertson, S. J. Roberts, S. G. Rowe, W. W. Sharp, William Stott, Percy Syder, J. Taylor Thompson, H. Wheeler, and William Whiteley, M.P.

Mr. William Stott, General Secretary of the Railway Clerks' Association, in proposing the toast "The Railway Convalescent Homes," said he was informed that some 7,000 patients were received every year and that his difficulty was to know in what form to offer the toast. Obviously from one point of view he could not express the wish that even more patients would be received in the future, and the position was similar to that he encountered recently when a young M.D. friend was starting in practice, and any wish for his business success seemed to connote "more patients every year" and thus by no means a kindly wish for his neighbours. The railway trade unions were vitally concerned in an endeavour to reduce sickness, but they also realised that those who were ill should have every opportunity of getting well. In this sphere the Railway Convalescent Homes met all requirements. They were light and airy, and afforded congenial society, good and abundant food, and excellent service. He attributed their success: 1, to the low cost of membership (½d. a week); 2, to the facilities granted by the railway companies of free travel to all patients and free collection of contributions through the pay sheets; 3, to the facilities afforded to committeemen (who gave their services voluntarily) to attend meetings; and 4, to the high standard maintained at the homes themselves. Mr. Stott concluded by paying tribute to the valued work of Mr. H. Haigh, the Secretary, to the members of the board of trustees, and to the doctors and staffs of the eight homes.

Sir Josiah Stamp, in reply, mentioned that it was his second appearance as President, and he hoped he was now regarded as a railwayman; when he last held office seven years ago many people looked upon him as an intruder into the world of railway affairs. He considered that the Railway Convalescent Homes provided one of the greatest monuments to the solidarity of the railway service. During the intervening years since he previously occupied the chair the difficult and lean years through which the railway companies had been passing had been reflected, of course, in the finances of the homes. The trustees had therefore not sought to extend the homes beyond their present total of five for men and three for women, but they had carried out a number of important improvements. The principal development—adopted at the suggestion of Lady Stamp—had been the provision at the Cheshire home (Leasowe Castle) of accommodation for mothers with babies up to eight months old; last year 136 mothers with babies were received there. The standard of all the homes had been raised by refurnishing, nearly every bed had been provided with a new mattress, cooking arrangements had been greatly improved and every home was now provided with a rest room. In view of the large number of patients suffering from digestive troubles, special diet was now provided at the Ascog home, and at present 50 per cent. of the patients at that home received a diet suited to their special complaint. The income from members had steadily improved and last year totalled nearly £40,000; the membership was thus over 350,000. Every patient cost the homes on an average over 50 years' contributions.

Mr. F. C. Holder, of the L.N.E.R., a member of the board of trustees, proposed the toast of "Our Guests," to which both Lady Stamp, J.P., and Mr. George Mathers, M.P., replied.

Lady Stamp emphasised the self-supporting position of the homes and said that outside help was infinitesimal. She stressed the psychological effect of convalescence in congenial surroundings, and mentioned an instance within her personal experience of a poor woman's first impression of a well-appointed bedroom as "a beautiful room to be ill in."

PARLIAMENTARY NOTES

G.W.R. Bill

This Bill came on March 11 before the Unopposed Bills Committee of the House of Commons and was ordered to be reported for third reading. It was considered in the House on March 17 and ordered to be read the third time. The Bill provides for the continuation between Ruislip and Denham of the authorised extension of the Ealing & Shepherd's Bush Railway, and for a small extension of the authorised avoiding line at Dawlish. The avoiding line is intended to remove congestion over the coast section between Dawlish and Newton Abbot and provide a diversion to guard against storm damage on the coastal section, and will also be a step towards the provision of four tracks between Exeter and Newton Abbot. The existing main lines will remain and the new lines will be for high speed traffic.

L.N.E.R. Bill

This Bill came on March 16 before a Select Committee of the House of Commons. The only matter opposed was the proposal to release the company from statutory obligations to cater for navigation on the remainder of the Nottingham Canal which is not being leased to the Trent Navigation Company. The Bill, with amendments, was reported to the House on March 17.

Southern Railway Bill

A Select Committee of the House of Commons began on March 17 the consideration of this Bill. Opposition was offered by the Duke of Westminster and tenants on his Grosvenor estate to a clause which sought to empower the company to pull down part of the boundary wall of its property in Buckingham Palace Road, in order to grant a lease of the site immediately behind the wall to Imperial Airways Limited. It was suggested by the petitioners that the use of this site for a terminus for Imperial Airways would involve the abandonment of the existing cab rank in Buckingham Palace Road and so diminish the present inadequate provision at Victoria for waiting cabs. For the promoters it was pointed out that it was most important that the Airways terminal station should have good road and railway access to provide easy connection with the proposed airport at Portsmouth.

Mr. Woods-Humphry, Managing Director of Imperial Airways Limited, said he thought the site of the new aerodrome would be Langstone Harbour, Portsmouth. They were hoping to move from Croydon to an aerodrome served by rail at Lullingstone in Kent. Special trains would probably run from the private platform attached to the proposed new building.

Evidence in support of the Bill was given yesterday by Mr. G. Ellson, Chief Engineer, and Mr. A. Endicott, Surveyor and Estate Agent, Southern Railway.

London Transport Bill

The Select Committee of the House of Commons, presided over by Sir David Reid, which has been considering this Bill since March 16, approved on Wednesday, March 17, of the proposal to run trolley vehicles along the Victoria Embankment, subject to the proviso that there must no turning places there.

STAFF AND LABOUR MATTERS

New Wage Claims of Railway Trade Unions

As was indicated in our issue last week, a joint meeting of the three railway trade unions was held in London on Friday, March 12, to consider the presentation of new wage claims to the railway companies. In its last Decision (No. 2, dated December 29, 1936), the tribunal made some pertinent remarks concerning the desirability of major claims being "presented under such conditions as to enable them to be considered adequately in all their aspects, and with a reasonable prospect of reaching a settlement acceptable to all concerned." The tribunal said: "If an application is such as to need consideration in connection with all or most grades of railway employees, or involves such large expenditure as to react adversely upon other claims, it can only receive adequate consideration by the tribunal if it is presented by unions which together represent the great bulk of the railway staff and at a time which does not cause it to conflict with other decisions which are operative for a prescribed period."

The trade unions clearly had these observations of the tribunal in their minds when they met last Friday for, after a discussion which lasted some hours, they decided to make simultaneous application to the railway companies of new wage claims. This does not mean, however, that the items of the claims of the respective unions will necessarily be identical. The official statement made at the end of Friday's meeting was in the following terms: "The executive committees of the National Union of Railwaymen, the Railway Clerks' Association, and the Associated Society of Locomotive Engineers and Firemen met at Unity House to review the position in relation to requests which are to be made upon the companies in respect of wages and conditions. It was agreed in respect of the various desires formulated by the three unions that there should be simultaneous application to the companies with a view to joint discussions on the various matters taking place with the railway companies' representatives. The date of submission is left to the officers of the three unions, but it is anticipated that this will be in the very near future."

The final sentence in the foregoing statement disposes of any hope which may have been entertained that the unions would recognise that the companies' financial position does not at present justify any such addition to the salaries and wages bill as new claims would involve.

Engineering Trade Unions Fusion Plans

A meeting was held at York on March 11 to consider the possibility of merging the interests of eleven engineering trade unions. It is planned to form one big employees' organisation in the engineering industry, and a scheme is being prepared by the Amalgamated Engineering Union, which, it is understood, is responsible for the idea and which has a membership of some 280,000. Unions which have agreed to consider the proposed merger include the Foundry Workers', the Brass Workers' and the Pattern Makers' Associations.

Working Hours of Young Persons

Last week there was published (His Majesty's Stationery Office: price 9d.) the Report of the Departmental Committee on the Hours of Employment of Young Persons in certain Unregulated Occupations. The committee was appointed in January, 1936, by the Home Secretary "to inquire into the hours of employment of young persons under 18 years of age (not being subject to the provisions as to hours of employment contained in the Shops Act, 1934, or the Factory and Workshop Act, 1901) who are employed: (*a*) in the capacity of van boy, errand boy, messenger, porter or warehouse boy, in connection with any commercial or industrial undertaking; or (*b*) in the capacity of page boy or of a lift or other attendant in any hotel or place of public entertainment, and to advise whether and, if so, how far, and by what methods, it may be desirable in the interests of the young persons concerned to regulate such employment."

Evidence was given by sixty-three witnesses, including Mr. Kenelm Kerr, O.B.E. (Assistant General Manager (Staff) London & North Eastern Railway, and Chairman, Railways Staff Conference) on behalf of the railway companies; and by Mr. John Marchbank, General Secretary, National Union of Railwaymen, on behalf of the Trades Union Congress General Council.

The report contains several references to the railway companies' position. Paragraph 31 states: "It would appear from the evidence which we have received that van boys form the largest class of young persons within our terms of reference. These van boys are employed (in the main on motor vehicles, but also to some extent on horse drawn vehicles) by railways, road transport undertakings and factories."

Paragraph 43 reads: "The representatives of the four-main line railway companies informed us that the hours of boys employed by railway companies were governed by the national agreement which provides for a forty-eight hour week, with special rates for overtime in excess of the forty-eight hours. The witness stated that the overtime worked by van boys would not exceed an average of 2 hours a week."

Paragraph 52 records that: "The representative of the railway companies stated that they employed about eight hundred boy messengers and a few girl messengers. The hours were governed by a national agreement providing for a forty-eight hour week, with overtime at special rates."

The committee states it is satisfied that a definite need exists for the regulation of the young persons covered by the inquiry. It goes on to say: "We consider that regulation is necessary from two points of view, both to prevent employment for unduly long hours, and to ensure that hours of employment, whether or not they are excessive, are so arranged as not to deprive the young persons of reasonable facilities for recreation and further education. These considerations naturally apply with varying force to the different classes of young persons falling within our terms of reference. In the case of van boys there is evidence both of a substantial proportion of excessive hours, and of variation in the time of ceasing work which is bound to affect opportunities for recreation and education. In the case of messengers, porters, errand boys and warehouse boys, there is less evidence of excessive hours, and the main problem to be faced is that of night employment in certain occupations."

The committee reports that: "A further ground for statutory regulation arises from the fact that the hours of young persons are not regulated by trade agreement, except in a few cases, and the proportion of young persons covered by such agreements is exceedingly small. In any event, we doubt whether regulation by agreements which permit an unrestricted amount of overtime affords sufficient protection for young persons." It was urged by the railway companies that a case existed for excluding their employees from regulation. "The railway companies based their claim for exclusion on the existence of a national agreement covering young persons, and of the arrangements made by the companies to implement the agreement."

It would appear that the committee was impressed by the companies' submissions, for it says: "We recognise that young persons employed by railway companies are in a more favourable position than most young persons elsewhere by reason of the national agreement, and the highly organised nature of the undertaking. We consider, however, that if statutory regulation is required in the interests of a particular class of young persons, taken as a whole, it is essential that the regulation should be applied without exception. In our view, the virtue of statutory regulation, as opposed, for example, to regulation by bye-law, or by trade agreement, lies in its universal application, with the consequent avoidance of anomalies as between one young person and another, or one employer and another. We think that it would be unreasonable to ask employers to accept a system of regulations which

permitted of exceptions, and placed certain of their number in a favoured position. We are therefore unable to recommend exclusion for the railway companies. These general considerations apply to the other claims for exclusion, but we would also point out that as regards hotels, road transport, and the showmen's industry, there is no such evidence as exists in the case of the railway companies of an organised avoidance of unduly long hours. We consider, therefore, that these claims for exclusion cannot be sustained.

"The representative of the railway companies urged that, if they were not altogether excluded from any statutory regulation, administrative control would be better handled centrally by a Government department rather than in detail by a large number of separate local authorities throughout the country. He considered that as the railways' own administration was centralised, it would be easier for them to deal with one central authority. He further urged that, in order to avoid dual control and dual inspection, there should be one central authority dealing with railway undertakings in all their aspects.

"As regards young persons employed by railway companies, we think that in view of the fact that railway companies operate in the area of so many local authorities, weight should be given to the plea made on behalf of the companies that the enforcement of statutory restrictions should in their case be in the hands of a central authority."

Pending comprehensive legislation for all young persons, which should aim at restricting their weekly working hours to something substantially less than forty-eight, with suitable provision for further daytime education, the committee recommends as an immediate step the following restrictions:—

(*a*) The normal working week should not exceed forty-eight hours, exclusive of intervals for meals and rest.

(*b*) The working day, including all intervals, should not exceed ten hours.

(*c*) A strictly limited amount of overtime should be permitted to young persons of sixteen and over, but overtime should be entirely prohibited for those under 16.

(*d*) Night work for a period of eleven hours, including the hours between 10.0 p.m. and 6.0 a.m., should be prohibited.

(*e*) Intervals for meals should be fixed by statute.

(*f*) Young persons employed on Sunday should receive a compensatory holiday during the week.

(*g*) A half-holiday from 1.30 p.m. at the latest should be allowed on one weekday each week.

TRANS-SIBERIAN LOCOMOTIVE RUN.—It is reported that a Russian-built steam locomotive fitted with a condensing tender recently hauled a thousand-ton freight train from Moscow to Vladivostok and back, a total distance of about 14,000 miles. Thanks to the condensing feature this type of locomotive can run about 620 miles on 2,200 gal. of water—that is, within the capacity of a normal tender.

London Transport Automatic Lifts

A new service of completely automatic lifts was brought into use at Goodge Street tube station early this month. Automatic control has been in use at Strand and Earls Court stations for some little time, but the Goodge Street installation is an improvement upon that system, and has doors in place of gates. The three new lifts are comparatively small, each having a capacity of 17 passengers only, but they are capable of a very quick "turn-round," and, though the Goodge Street shaft is 85 ft. deep, a service providing for one of the lifts to leave each landing every 34 sec. is in force during rush hours. To secure this result, with ample time at each landing for ingress and egress, a speed of 6·7 m.p.h. is required of each lift to secure a round-trip time of 102 sec. The automatic control is so arranged that uniform time spacing between cars is maintained whether only two or all three lifts are in use at a time. Manual press-button control can be substituted for the automatic control by the use of switches on each landing, in each car, or in the machine room, at times when traffic is very light.

Upon a lift reaching a landing, the exit doors open, allowing passengers to leave, and shortly afterwards the entrance doors open allowing passengers to enter. A warning sign is then exhibited at the exit doors both in the car and on the landing, and at the same time a concealed loud-speaker warns passengers to "stand clear of the doors," after which the exit doors close. After an interval, similar warnings are given at the entrance doors, which then close. The lift then proceeds immediately to the other landing, where the same cycle of operation is repeated. Illuminated indicators are provided at the top and bottom entrance landings indicating which lift will be next available.

Driving and Controlling Equipment

This is situated immediately above the shaft and comprises in the main, (*a*) a motor-generator and exciter with starter, which can be started and stopped either by hand switch or by push buttons, operated from the board's d.c. traction supply at approximately 630 V., and (*b*) the control gear which performs automatically the entire operation in sequence of the three lifts and is achieved by means of specially arranged electrical relays which provide an electrical impulse to other relays at regular intervals. These, in turn, cause the opening and closing of main control switches, one for each particular operation.

The main hoisting motors are of the gearless direct drive type, the hoisting sheaves being coupled directly to the armature shafts.

The plant is amply equipped with safety and alarm devices, among them being an alarm push in the car for emergency use by passengers; this calls an attendant to the landing at which it will arrive and suitably operates the gates. The usual switches are also provided which make it impossible for a lift to leave a landing with any door open, and should the doors be obstructed an alarm bell rings. Moreover, each car is provided with an emergency exit door opposite to the corresponding door in the adjacent car, so that in the remote possibility of a car becoming stalled between landings an adjacent car can come to its relief and the passengers can be transferred to the relief car. Each lift is also provided at its top and bottom entrance landing with an emergency stop button for the use of the station staff.

Both the car and counterweight are fitted with clamp type safety gear which is brought into operation by governors should the speed of either exceed a predetermined value. In addition, provision is made enabling the lift to be handwound to the nearest landing in the event of the power supply failing. Alarm bells and indicators operate when the doors are slow in closing, a car fails to start, or stops in the well, when operated by a passenger, or when an indicator or lamp fails. Although each lift is provided with seven ropes of which two would be sufficient to carry the load, a device is fitted which stops all three lifts if even one rope becomes slack or breaks.

The lifts and their driving and controlling equipment together with all safety devices were installed by Waygood-Otis Limited, but the automatic control gear was supplied by Standard Telephones & Cables Limited, the speech equipment by E. F. Moy Limited, and the amplifier by Film Industries Limited. The rectifier for the automatic control gear is by Westinghouse Brake & Signal Co. Ltd., and the air door engines by G. D. Peters & Co. Ltd.

ROAD ACCIDENTS.—The Ministry of Transport return of persons killed and injured in road accidents during the month of February is as follows. The figures in brackets are the fatalities in the corresponding period of 1936. Injury returns being now presented in a modified form (see our issue of January 22), no comparison is made with the preceding year:—

	Killed		Injured	
			Serious	Slight
England—				
Pedestrians ...	220	(204)	1,166	3,619
Others... ...	185	(162)	1,825	5,324
Wales—				
Pedestrians ...	6	(14)	59	129
Others... ...	6	(11)	95	188
Scotland—				
Pedestrians ...	36	(30)	153	373
Others... ...	8	(14)	154	406
	461	(435)	3,452	10,039

The total fatalities in the preceding month were 521, compared with 448 in the corresponding period of 1936.

RAILWAY AND OTHER MEETINGS

British Automatic Co. Ltd.

The ordinary general meeting of the British Automatic Co. Ltd. was held at Winchester House, Old Broad Street, E.C., on Wednesday, Major R. D. K. Curling, M.C., Chairman and Managing Director, presiding.

The Secretary (Mr. William A. Ballard) read the notice convening the meeting and the auditors' report.

The Chairman, in moving the adoption of the report and accounts, said that shareholders would have noticed that this was the fiftieth ordinary general meeting of the company, but as the company was not incorporated until November 25, 1887, he proposed to refer to their Jubilee after they had completed fifty years trading. Turning to the balance sheet, machines and fittings at £388,643 showed a reduction of £1,037, which was made up of £8,428 written off in respect of machines scrapped during the year, less additions amounting to £7,391 after deducting sales. Freehold and leasehold premises, plant, machinery, &c., showed an increase of £264 by reason of net additions amounting to £1,595, less depreciation of £1,331. Investments in subsidiary companies showed a reduction of £9,647, due to the amount written off by a transfer to depreciation and renewals in respect of machines scrapped by subsidiary companies during the year. Amounts due by subsidiary companies showed a reduction of £571. Sundry debtors were £6,995 less, as during the year they had received a payment of £6,178 from the Associated Automatic Machine Corporation Limited on account of the amount owing to them; and other debtors, &c., were less by £817. There were increases of £9,801 in investments in British Government securities and other investments; and of £31,287 in cash on deposit at short notice and cash at bankers.

Every effort had been made to keep their automatic machines in first class order, to make them attractive, and to conform to modern standards in appearance. Those who travelled on the railways, particularly on the Underground railways of London, would have noticed their new design of circular and semi-circular multiple type machines with up to sixteen different vending columns, and also the smartness of the new groups of wall machines now in use.

For the year to December 31, 1936, the net profit, subject to depreciation of automatic machines, amounted to £41,065. That compared with a profit for the *15 months* to December, 1935, of £37,444. These figures were not comparable, but the fact that in the shorter period of 12 months they had earned £3,621 more than in the previous 15 months, showed that progress was being made. To the year's profit of £41,066 should be added the balance of profit brought forward from 1935 of £7,040, making a total of £48,106, from which they had allocated to depreciation and renewals account the sum of £28,075. From the balance of £20,031 the directors recommended the payment of a dividend of 3½ per cent. free of tax, which would absorb £14,000, leaving to be carried forward £6,031.

The results of almost every department of the business had shown an improvement. The company had upwards of 50,000 machines of all kinds and descriptions in operation almost everywhere in the British Isles, some of them in very remote places. Receipts from vending machines again showed an increase, and they had made every endeavour to increase the quality of the goods supplied through them. The amusement side of their business had increased satisfactorily, and they had negotiated a number of new sites for the present year. The weighing machine side of their business was also satisfactory, and he was glad to see that with the public weight as a guide to health was still recognised. During 1936 a total of wise people, equivalent to 15 times the weight of the *Queen Mary*, ascertained their correct weight on the company's machines.

Relations with the railway companies continued to be satisfactory, and he would like to accord his appreciation to their officers for the very willing and helpful way in which they had at all times met them in all matters of mutual interest. Before putting the resolution, he wished to express appreciation of the efforts of all who had helped the company to attain a successful year. Mr. F. L. Timmins, who was appointed as General Manager last March, had proved himself to be a most suitable person for the post, and thanks were due to him and all the staff under him for the results achieved during the last 12 months. Provided the international situation remained quiet, he had every hope that the progress achieved during the year under review would be maintained, and if possible improved.

The report and accounts, with the payment of a dividend of 3½ per cent. free of income tax, equal to 8·4d. per share, were unanimously adopted.

The meeting closed with the re-election of Col. William Parker, D.S.O., as a director, and the passing of a vote of thanks to the Chairman and board.

RAILWAY AND OTHER REPORTS

East Kent Light Railways.—The report for the year 1936 shows a net revenue of £3,374, against £3,343 for 1935. The amount written off for tax is £800. A payment of 2 per cent. debenture interest is being made, and £62 is to be carried forward.

Derwent Valley Light Railway.—Gross receipts from railway working in 1936 amounted to £7,821, against £7,433 in 1935, and expenditure increased from £5,544 to £6,092, leaving net receipts £161 lower at £1,729. Miscellaneous receipts (net) were £739, against £443, and net revenue rose from £2,333 to £2,468. After adding £1,096 brought forward and deducting fixed charges, the sum of £1,898 is available. The directors propose to appropriate £500 (against £1,000) to general reserve, and to carry forward £1,398. The total tonnage carried amounted to 60,475 tons, a record tonnage in the history of the company. Total traffic receipts were £7,755, of which £7,654 came from goods train traffic, £88 from parcels, and £13 from passengers.

Canadian National Railways.—The report for 1936 shows operating revenues of $186,610,489, and a net revenue for the year of $15,132,799. Taxes, rentals and other cash requirements amounted to $8,723,888, and the interest on funded debt held by the public was $49,184,622. The cash deficit for the year totalled $43,303,393, which is a betterment of $4,118,070 over 1935. All branches of the system, including freight, passenger, mail revenues, express, telegraphs and hotels show increased revenue during 1936. Refunding operations reduced the requirements for interest on the funded debt by $4,284,169.

Hoffmann Manufacturing Co. Ltd.—The directors announce a final dividend on the ordinary shares of 9 per cent. (against 6 per cent.) and a bonus of 5 per cent. (the same), both tax free, making a total of 20 per cent., tax free, for the year ended December 31, compared with 15 per cent., tax free, for 1935.

British Automatic Co. Ltd.—Net profit, subject to depreciation of automatic machines and the payment of £13,310 for debenture interest, for the year ended December 31, 1936, amounted to £41,066. Adding £7,040 brought in, gives a total of £48,106. The directors propose to allocate £28,075 to depreciation and renewals account, and to pay a dividend of 3½ per cent., tax free, which will absorb £14,000, leaving £6,031 to be carried forward. A further result of the conversion in 1935 of the 8 per cent. debentures into 5½ per cent. debenture stock has been a net saving of £3,617 in debenture interest. The year's results are not comparable with those of the previous 15 months in consequence of the alteration in 1935 of the termination of the financial year to December 31. Takings of the machines continue to increase.

NOTES AND NEWS

Folkestone Warren Landslide.—Owing to a landslide near the Southern Railway main line between Folkestone and Dover, traffic has been temporarily suspended betwen 6.30 p.m. and 7 a.m. each night since March 16 as a precautionary measure.

French Railway Accident.—An express from Paris to Le Mont-Dore, on March 13 ran into a tree which had been blown across the line at Châteauneuf-sur-Cher, near Bourges. Fifteen persons lost their lives and a number of others were injured.

The Tyne Dock Sale.—The Tyne Improvement Commission, at its monthly meeting in Newcastle on March 16, resolved to affix its common seal to an agreement to acquire Tyne Dock from the L.N.E.R. April 30 is the suggested day for taking over the property. The purchase price is £600,000, and the Commissioner for Special Areas is contributing £150,000 in addition to the Tyne Commission's offer of £450,000.

New S.R. Lydd to New Romney Line.—Work has begun on the construction of the new Southern Railway line from a point between Lydd and Dungeness to New Romney. The line, which is to be about 3¾ miles in length, was authorised in 1935, and is required in connection with the development of Greatstone and Littlestone-on-Sea as seaside resorts. When this line is opened the existing branch from Lydd to New Romney will be closed.

L.N.E.R. Boxing Championships.—Sir Murrough J. Wilson (Deputy Chairman, L.N.E.R.) presented the awards on March 17 to contestants in the seventeenth amateur boxing championships of the Great Eastern Amateur Athletic Association, held at the Stadium Club, High Holborn, W.C.1. Col. H. H. Mauldin (Superintendent, Eastern Section, L.N.E.R., and Chairman of the Association) presided. All contests were keenly fought, and the featherweight class was so keen that both semi-finals and the final were won on a casting vote.

Proposed South Lancashire Transport Board.—The proposal to establish a Passenger Transport Board for South-East Lancashire and North-East Cheshire has been shelved. On January 19 a conference representing the local authorities, the railway companies, and the important bus companies concerned was held at the Manchester Town Hall, and decided that there was a case for "investigating the possibilities of further passenger transport co-operation, including co-ordination with the railways." A committee consisting of representatives of these interests met on March 15 at the Manchester Town Hall and passed the following resolution: "That this meeting is not in favour of proceeding further at the present time to investigate the desirability of constituting a joint transport authority for South-East Lancashire and North-East Cheshire."

Derailment in Jugoslavia.—A passenger train collided with a rock which had fallen on to the track of the Jugoslavian State Railways main line between Belgrade and Skoplje last Monday. Three persons are reported to have lost their lives and a number to have been injured.

The Salzkammergut Railway.—It is reported from Vienna that the Salzkammergut Railway, which was closed on February 10 owing to lack of funds (see THE RAILWAY GAZETTE, February 19, page 340), was reopened on the morning of March 12. Prolonged negotiations between the Austrian Government and the provincial administrations of Salzburg and Upper Austria are understood to have resulted in raising the necessary sum of 180,000 schillings to enable traffic to be resumed.

Bus and Coach Licences for Three Years.—The Minister of Transport has given notice of his intention to make regulations extending to three years the period of validity of road service licences for stage carriage services granted after April 30, 1937. The regulations are designed to relieve operators of stage carriage services of the necessity of making applications to the Traffic Commissioners every year and, it is added, must be regarded as being of an experimental nature for the present.

Ministry of Transport Report on Light Railways.—The report of the proceedings of the Ministry of Transport under the Light Railways Acts up to December 31, 1936, shows one application made in 1935 and one in 1936 for extensions of the Liverpool Corporation Light Railways, these being of the B or tramway class. The 1935 application for an extension of 11 miles 8 chains was approved as to 9 miles 53 chains, and the 1936 application for an extension of 9·6 chains was approved. The total number of applications made since 1896 has been 785, of which 524 with a total mileage of 2,350 have been granted and 261 with a total mileage of 2,973, have been rejected or withdrawn.

Co-operation between Users and Manufacturers.—On the occasion of a visit, on March 17, of the Transmission Section of the Institution of Electrical Engineers to the Willesden switchgear factory of the British Thomson-Houston Co. Ltd., the guests were received by Sir Felix J. C. Pole, Chairman of Associated Electrical Industries Limited, in company with Mr. H. N. Storborg, Chief Engineer of the B.T.-H. Sir Felix referred to the endeavours of the firm to give honest engineering advice and good value, and appealed to users of switchgear to co-operate more fully with manufacturers by discussing projects and reporting operation data. He also remarked that the visit would demonstrate the high value that the firm set upon research and assured the visitors that it was intended to continue spending money freely in order not only to keep abreast of the best modern practice, but also to establish a lead in developments.

St. Anton Cableway, Austria.—Work has just begun on the construction of a cableway in the Arlberg winter sports area, from St. Anton to the summit of the Galzig peak, 6,900 ft. in altitude. The length of the cableway will be about 9,000 ft., and its principal feature will be its speed. As compared with what is believed to be the fastest existing cableway speed, 18 ft. p.s., one of 21 ft. p.s. is aimed at on the new cableway, so that the whole distance between termini will be covered in about 7½ min. This £60,000 work should be completed by December.

York Railway Museum.—We are pleased to learn that, in succession to Mr. Thomas Hornsby, Mr. C. M. Jenkin Jones, Divisional General Manager, North Eastern Area, L.N.E.R., has been appointed Chairman of the committee of the York Railway Museum, in which he has always taken a great interest. The popularity of the museum continues. During the year 1936 visitors were more numerous than ever, and there were as many as 4,000 persons in a single month; they came from nearly every part of the world. The year 1937 promises to be equally successful. Already important parties have arrived, including one of students from Cape Town University.

New L.M.S.R. Turntables.—In connection with the extending use of larger and more powerful standard locomotives, the L.M.S.R. to is install this year bigger turntables at twelve places on the system. Turntables of 60-ft. diameter are to be installed at Stafford, Northampton (Bridge Street Loco.), Leeds (Holbeck No. 1 shed), Sutton Oak (Lancs), Sheffield (Pond Street), Saltley (Birmingham), Lancaster (Green Ayre), Lower Darwen (Lancs.), Edinburgh (Princes Street), and Tain (Ross-shire). A new turntable of 58-ft. diameter is to be provided at Wigan, and one of 55-ft. diameter at Wemyss Bay, Renfrewshire. All these turntables will be of the vacuum-operated type, whereby the power for rotating the turntable is provided by the locomotive which is being turned.

Improvements to L.N.E.R. Locomotive Depot, Bradford.—The L.N.E.R. has decided upon a comprehensive scheme of improvements to the locomotive depot at Bradford, where 63 engines are stationed and about 35,600 tons of coal are handled annually. A bunker-type coaling plant having a capacity of 175 tons is to be installed, with the necessary accommodation for coal wagons and a re-arrangement of the existing sidings. The arrangements for the inspection of locomotives will also be modernised, the existing two disposal pits being raised to the level

of the pit on the adjacent road, and arrangements made to facilitate the removal of ashes. The cost of the complete scheme, which is to be put in hand at once, will be in the neighbourhood of £9,000.

Forthcoming Events

Mar. 19 (*Fri.*).—G.W.R., at Queen's Hall, Langham Place, London, W.1, 7.45 p.m Smoking Concert.
Institute of Transport (East Midlands), at Guildhall, Nottingham, 7 p.m. "Highways for Transport," by Mr. J. Haller.
Institute of Transport (Leeds Graduate), at City Transport Department, 7 p.m. "Transport and Sport," by Mr. E. Tyler.
Mar. 22 (*Mon.*).—Engineers' German Circle, at Inst. of Mechanical Engineers, Storey's Gate, London, S.W.1, 6 p.m. "The Development of Electric Control on Machine Tools," by Herr K. Maecker.
Institute of Welding (Tees-side), at Cleveland Scientific Inst., Corporation Road, Middlesbrough, 7.30 p.m. "Cast Iron Welding," by Mr. L. Tibbenham.
Permanent Way Institution (London), at Underground Railways Dining Club, Pelham Street, S.W.7, 7 p.m. "Tonbridge Alterations—an Example of Civil Engineering," by Mr. L. Catchpole.
Mar. 23 (*Tues.*).—Institution of Automobile Engineers, at Royal Society of Arts, John Street, London, W.C.2, 7.45 p.m. "Properties of Some Materials for Cast Crankshafts, with Special Reference to Combined Stresses," by Dr. H. Gough.
Institution of Locomotive Engineers (Manchester), at 36, George Street, 7 p.m. "Streamlining of Locomotives," by Mr. J. Jones.
L.N.E.R. Musical Society, at Hamilton Hall, Bishopsgate, London, E.C.2, 8 p.m. Bohemian Concert.
L.N.E.R. (York) Lecture and Debating Society, at Railway Inst., Queen Street, 6.45 p.m. Annual Meeting and Reading of Prize Essays.
Permanent Way Institution (Scottish), at Royal Technical College, George Street, Glasgow, 7.30 p.m. "Permanent Way Calculations," by M. Frieze.
Mar. 24 (*Wed.*).—Institution of Civil Engineers, at Guildhall, London, E.C.2, 7.15 for 7.45 p.m. Annual Dinner.
Mar. 30-Apr. 3.—Model Railway Club Exhibition, at Central Hall, Tothill Street, London, S.W.1.
Apr. 1 (*Thurs.*).—Institution of Locomotive Engineers (London), at Trocadero Restaurant, Shaftesbury Avenue, W.1, 6.30 for 7 p.m. Annual Dinner.
Apr. 2 (*Fri.*).—Institute of Transport (Leeds), at Town Hall, 6.30 p.m. Annual General Meeting.
Institute of Transport (Manchester-Liverpool), at Exchange Station Hotel, Liverpool, 6.30 p.m. "The Coasting Trade—Modern Development and Trend," by M. A. Robinson.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 10th Week			Totals to Date		
	1937	1936	Inc. or Dec.	1937	1936	Inc. or Dec.
L.M.S.R. (6,877¾ mls.)	£	£	£	£	£	£
Passenger-train traffic	391,000	372,000	+ 19,000	3,766,000	3,670,000	+ 96,000
Merchandise, &c.	494,000	499,000	– 5,000	4,790,000	4,653,000	+ 137,000
Coal and coke	297,000	268,000	+ 29,000	2,906,000	2,878,000	+ 28,000
Goods-train traffic	791,000	767,000	+ 24,000	7,696,000	7,531,000	+ 165,000
Total receipts	1,182,000	1,139,000	+ 43,000	11,462,000	11,201,000	+ 261,000
L.N.E.R. (6,320 mls.)						
Passenger-train traffic	261,000	249,000	+ 12,000	2,521,000	2,460,000	+ 61,000
Merchandise, &c.	347,000	341,000	+ 6,000	3,268,000	3,199,000	+ 69,000
Coal and coke	274,000	251,000	+ 23,000	2,641,000	2,667,000	– 26,000
Goods-train traffic	621,000	592,000	+ 29,000	5,909,000	5,866,000	+ 43,000
Total receipts	882,000	841,000	+ 41,000	8,430,000	8,326,000	+ 104,000
G.W.R. (3,738½ mls.)						
Passenger-train traffic	166,000	163,000	+ 3,000	1,576,000	1,551,000	+ 25,000
Merchandise, &c.	201,000	201,000	—	1,914,000	1,858,000	+ 56,000
Coal and coke	121,000	104,000	+ 17,000	1,176,000	1,142,000	+ 34,000
Goods-train traffic	322,000	305,000	+ 17,000	3,090,000	3,000,000	+ 90,000
Total receipts	488,000	468,000	+ 20,000	4,666,000	4,551,000	+ 115,000
S.R. (2,153 mls.)						
Passenger-train traffic	245,000	241,000	+ 4,000	2,479,000	2,389,000	+ 90,000
Merchandise, &c.	60,500	63,500	– 3,000	563,500	589,000	– 25,500
Coal and coke	34,500	33,500	+ 1,000	345,500	381,000	– 35,500
Goods-train traffic	95,000	97,000	– 2,000	909,000	970,000	– 61,000
Total receipts	340,000	338,000	+ 2,000	3,388,000	3,359,000	+ 29,000
Liverpool Overhead (6½ mls.)	1,121	1,055	+ 66	11,767	11,195	+ 572
Mersey (4½ mls.)	4,154	4,033	+ 121	42,148	40,817	+ 1,331
*London Passenger Transport Board	548,800	539,400	+ 9,400	20,667,600	20,664,600	+ 603,000
IRELAND						
†Belfast & C.D. (80 mls.) pass.	1,616	1,737	– 121	16,591	18,175	– 1,584
,, ,, goods	589	466	+ 123	5,134	5,606	– 472
,, ,, total	2,205	2,203	+ 2	21,725	23,781	– 2,056
Great Northern (543 mls.) pass.	7,300	7,700	– 400	75,450	78,150	– 2,700
,, ,, goods	9,650	11,150	– 1,500	91,300	99,700	– 8,400
,, ,, total	16,950	18,850	– 1,900	166,750	177,850	– 11,100
Great Southern, (2,075 mls.) pass.	24,739	25,657	– 918	260,414	266,549	– 6,135
,, ,, goods	40,856	45,055	– 4,199	417,050	418,937	– 1,887
,, ,, total	65,595	70,712	– 5,117	677,464	685,486	– 8,022

* 37th week † 11th week

British and Irish Railway Stocks and Shares

Stocks	Highest 1936	Lowest 1936	Prices Mar. 17, 1937	Prices Rise/Fall
G.W.R.				
Cons. Ord.	64¼	45½	56¼	–¾
5% Con. Prefce.	126½	116¾	109½	—
5% Red. Pref. (1950)	113	108½	109½	—
4% Deb.	119½	110½	103	—
4¼% Deb.	121	114	108	—
4½% Deb.	129	121	113½	—
5% Deb.	141	134	124½	—
2½% Deb.	79⅛	74	65½	—
5% Rt. Charge	136½	130	120½	—
5% Cons. Guar.	135¼	127¾	118½	—
L.M.S.R.				
Ord.	35⅝	17	28½	+½
4% Prefce. (1923)	83	52½	72	—
4% Prefce.	92¾	81	81	—
5% Red. Pref. (1955)	109¼	103¼	103½	—
4% Deb.	111¾	105 9/16	101	—
5% Red. Deb. (1952)	119⅝	115½	113½	—
4% Guar.	106¾	101⅝	98	—
L.N.E.R.				
5% Pref. Ord.	14	9	9½	—
Def. Ord.	7¼	4¾	5	—
4% First Prefce.	79¼	55¼	66	–1
4% Second Prefce.	31⅞	18¼	22	—
5% Red. Pref. (1955)	100½	77¾	91	–3½
4% First Guar.	104½	98¾	93	—
4% Second Guar.	99	90	86½	–½
3% Deb.	85¾	79	75	–½
4% Deb.	109¾	104½	100	—
5% Red. Deb. (1947)	116¼	110½	107½*	–2
4½% Sinking Fund Red. Deb.	111½	107½	107½	+1
Southern				
Pref. Ord.	98¾	82½	88	—
Def. Ord.	27⅝	20⅛	22½	—
5% Pref.	120¾	118½	107½	—
5% Red. Pref. (1964)	119¾	115¼	111½	—
5% Guar. Prefce.	136	129½	118½	–1
5% Red. Guar. Pref. (1957)	120	115¾	112½	—
4% Deb.	117 16	109½	102½	—
5% Deb.	140	134	124½	—
4% Red. Deb. 1962–67	116½	110	107	—
Belfast & C.D.				
Ord.	9	4½	4	–1
Forth Bridge				
4% Deb.	107	105	102½	—
4% Guar.	107 16	104	100½	—
G. Northern (Ireland)				
Ord.	19½	9¾	10	—
G. Southern (Ireland)				
Ord.	63	41	48½	—
Prefce.	65	46	55	–2½
Guar.	97¼	81	78½	–1½
Deb.	99¾	83¼	90	–1½
L.P.T.B.				
4½% "A"	127¾	121	112½	—
5% "A"	138¼	133½	124½	—
4½% "T.F.A."	111½	108⅛	105	—
5% "B"	131¾	123¾	119½	—
"C"	112½	93	90	—
Mersey				
Ord.	40¾	23	33½	–2
4% Perp. Deb.	103	98	99	—
3% Perp. Deb.	78	74⅝	75½	—
3% Perp. Prefce.	68⅞	63¼	62½	–2

* ex dividend

OFFICIAL NOTICES

The Bengal & North Western Railway Company Limited
The Rohilkund and Kumaon Railway Company, Limited

THE Directors are prepared to receive Tenders for the supply of :—

504 BUFFERS FOR CARRIAGES AND WAGONS,

as per Specification to be seen at the Company's Offices.

Tenders addressed to the undersigned, and envelope marked "Tender for Buffers," with name of firm tendering, to be lodged not later than Noon on the 31st day of March, 1937.

For each Specification a fee of 10s. will be charged, which cannot, under any circumstances, be returned.

The Directors do not bind themselves to accept the lowest or any Tender.

By Order of the Board,
J. WILLIAMSON,
Managing Director.
Secretary.

237, Gresham House,
Old Broad Street,
London, E.C.2.
15th March, 1937.

South Indian Railway Co. Ltd.

THE Directors are prepared to receive Tenders for the supply of :—

1. PRESSED STEEL SLEEPERS, &c.
2. SOLID DRAWN STEEL BOILER TUBES.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Company Limited, marked "Tender for Steel Sleepers," or as the case may be, with the name of the firm tendering, must be left with the undersigned not later than 12 Noon, Monday, the 5th April, 1937.

The Directors do not bind themselves to accept the lowest or any Tender.

A charge, which will not be returned, will be made of £1 for each copy of Specification No. 1 and of 10s. for each copy of Specification No. 2.

Copies of the Drawings may be obtained at the Offices of the Company's Consulting Engineers, Messrs. Robert White & Partners, 3, Victoria Street, S.W.1.

E. A. S. BELL,
Managing Director.

91, Petty France,
Westminster, S.W.1.
17th March, 1937.

OFFICIAL ADVERTISEMENTS.

OFFICIAL ADVERTISEMENTS intended for insertion on this page should be sent in as early in the week as possible. The latest time for receiving official advertisements for this page for the current week's issue is noon on Thursday. All advertisements should be addressed to :—*The Railway Gazette*, 33, Tothill Street, Westminster, London, S.W.1.

CONTRACTS AND TENDERS

The Metropolitan-Cammell Carriage & Wagon Co. Ltd. has received an order from the South African Railways and Harbours Administration for 12 steel main-line air-conditioned passenger coaches.

The L.N.E.R. has decided upon a comprehensive scheme of improvements to the Bradford locomotive depot. The cost of the scheme is estimated at £9,000. Further details are given on page 557 of our news section this week.

Martin & Company has received an order from the Chief Controller of Stores, Indian Stores Department, New Delhi, for 1,500 cwt. of mild steel sheets required for the East Indian Railway, at a total price of Rs. 16,172.

The Chinese Government Purchasing Commission has placed the following orders for equipment required for the Canton-Hankow Railway, to be supplied to the inspection of Messrs. Fox & Mayo :—

Muir Machine Tools Limited, One slotting machine and one vertical drilling machine.
Beyer, Peacock & Co. Ltd., One portable cylinder and valve boring machine and one portable locomotive crank-pin turning machine.
Associated British Machine Tool Makers Limited, One Universal brass-finishing lathe.
John Lang & Sons Limited, Two 8½-in. centre lathes.
Thomas Robinson & Sons Ltd., One Universal woodworker and one 36-in. band saw.
Ingersoll-Rand & Co., Two air-cooled motor air compressors with tools.
Laurence, Scott & Electromotors Limited, 17 electric a.c. motors.
Crompton-Parkinson Limited, Electric desk and ceiling fans.
Morgan Crucible Co. Ltd., One Morgan's patent tilting furnace of 400-lb. capacity.
Robert Stephenson & Co. Ltd., Four sets of tender wheels and axles.

Jessop & Co. Ltd. has received an order from the Chief Controller of Stores, Indian Stores Department, New Delhi, for one hand-operated 10-ton travelling jib crane at a total price of Rs. 18,847; and five hand-operated 5-ton travelling jib cranes at a total price of Rs. 81,510.

L.M.S.R. New Excursion Trains

Among the firms which have supplied materials and fittings for the new L.M.S.R. excursion trains described and illustrated elsewhere in this issue are the following :—

Appleby-Frodingham Steel Co. Ltd. : Steel angles.
Beckett, Laycock & Watkinson Limited : Dovetail floor sheeting.
Clyde Rubber Company : Carriage springs.
G. Spencer Moulton & Co. Ltd. : I.R. springs.
Stewarts and Lloyds Limited : Steel bars.
Metropolitan-Cammell Carriage & Wagon Co. Ltd. : Inside and outside twin couplers.
Steel, Peech & Tozer : Centres.
Colvilles Limited : Steel panels.
British Thomson-Houston Co. Ltd. : Gas-filled lamps.
General Electric Co. Ltd. : Nacrolaque panels.
Laycock Engineering Co. Ltd. : Automatic vacuum valve box.
Sorbo Limited : Draught preventers.
Attwater & Sons : Leatheroid strips.
Dunlop Rubber Co. Ltd. : Moulded rubber fillings.
I.C.I. (Rexine) Limited : Rexine brand leather cloth.
J. Kaye & Sons Limited : Inside carriage door locks.
Lace Web Spring Co. Ltd. : Seat back springs, cushion springs, and seat springs.
Leyland & Birmingham Rubber Co. Ltd. : Droplight rubbing blocks.
J. W. Roberts Limited : Cork flooring.
Westinghouse Brake & Signal Co. Ltd. : Valves and heaters, and lavatory water heaters.
A. G. Wild & Co. Ltd. : Valves, and extractor ventilator sliding lights.
G. D. Peters & Co. Ltd., and Murex Welding Processes Limited : Electrodes.
G. Turton Platts & Co. Ltd. : Buffer rods.
G. Spencer Moulton & Co. Ltd. : Diaphragms.
Nobel Chemical Finishes and Docker Bros. : Paint and varnish.
J. Stone & Co. Ltd. : Cells, Nowash type.

Taylor Brothers & Co. Ltd. has received an order from the Central Argentine Railway for 100 locomotive tyres.

Thomas Smith & Sons (Rodley) Limited has received an order from the Crown Agents for the Colonies for two 3-ton steam travelling cranes for the Gold Coast Government Railway.

The Drewry Car Co. Ltd. has received orders from the Crown Agents for the Colonies for one 4-ft. 8½-in.-gauge and two metre-gauge petrol-driven inspection trolleys required for the Iraq Government Railways.

D. Wickham & Co. Ltd. has received an order from the Crown Agents for the Colonies for two No. 6 rail motor trolleys for the Gold Coast Government Railway.

Heatley & Gresham Limited has received an order from the Chief Controller of Stores, Indian Stores Department, New Delhi, for 400 chilled cast-iron wheels at the price of Rs. 10,800.

Heatley & Gresham Limited has also received an order from the Chief Controller of Stores, G.I.P. Railway, Bombay, for 66 tons of Cupoline B111 quality refractory material for use in cupolas and oil-fired furnaces.

William Shurmur & Sons Ltd. has received an order from the London Passenger Transport Board for the complete reconstruction of Ruislip Manor station. Work will begin immediately and will occupy a year. The new station will abolish the inconvenience now occasioned to London-bound passengers because the booking hall is some distance from the platform. Entrances on each side of the bridge in Victoria Road will lead to a modern booking hall under the tracks. Broad stairs will give access to new platforms, with shelters and waiting rooms. Public rooms, telephones, and ticket machines will be provided, and shops will be built on land adjoining the station.

Railway Share Market

The approach of the Easter holidays and the uncertainties attaching to the Budget are among the factors which have tended to reduce the volume of business in the stock and share markets this week. Home railway stocks have again been in only small demand despite further good traffic figures, and the view is gaining ground that they may not show any marked recovery until British Government securities develop a strong tendency or there is a satisfactory settlement of the wages question.

L.M.S.R. ordinary improved ¾ to 28½ on the excellent gain of £43,000 shown by the past week's traffics, and there was also a better tendency in the 4 per cent. preference and 1923 preference, both of which give apparently attractive yields. Satisfaction was expressed with the gain of £41,000 disclosed by the L.N.E.R. traffic return and the second preference was fractionally better at 22¼ on Wednesday, while there was a somewhat firmer tendency in the preferred and deferred stocks. Great Western rallied from 56 to 56½. In this case the traffic gain for the past week was £20,000 which was up to best expectations. Southern preferred and deferred were fractionally better on Wednesday at 88¼ and 22¾ respectively, but the improvement was not held. The Southern was only able to report an improvement of £2,000 in last week's traffics. It is realised that so soon as weather conditions are better the company's receipts are likely to benefit satisfactorily. Many brokers are recommending the preferred stock as a reasonably good high-yielding stock as there seem favourable prospects that it will continue to receive its full 5 per cent. dividend. London Transport "C" stock remained out of favour.

Argentine railway stocks were also assisted by favourable traffic returns and on Wednesday they showed a much firmer tendency than earlier in the week, but in most cases prices are slightly lower on balance. B.A. Gt. Southern, B.A. Western and Central Argentine were firm subsequently, while there was recovery in B.A. Gt Southern 5 per cent. preference and Central Argentine 6 per cent. preference to 80½ and 96½ respectively. B.A. Pacific issues were dull at lower prices.

Elsewhere San Paulo was better at 97 and Antofagasta improved to 25½, but selling of Leopoldina 4 per cent. debentures was in evidence. French Sterling bonds were in request. Canadian Pacific ordinary and preference were lower, speculative interest in them having declined now the full report has been published, but American railway shares were active with a general trend to higher prices.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1936-37	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1936	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1936	Prices: Lowest 1936	Prices: Mar. 17, 1937	Yield % (See Note)
				£	£		£	£	£					
South & Central America	Antofagasta (Chili) & Bolivia	834	14.3.37	20,560	— 6,650	11	174,350	152,350	+ 22,000	Ord. Stk.	25	15¼	25½	Nil
	Argentine North Eastern	753	13.3.37	7,177	— 1,031	37	322,715	288,468	+ 34,247	,,	12	2	14	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	54	45	93	4⅝
	Bolivar	174	Feb., 1937	5,700	— 950	9	11,100	12,150	— 1,050	6 p.c. Deb.	9	5	8½	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	16	11½	16½	3
	Buenos Ayres & Pacific	2,806	13.3.37	125,310	+ 20,081	37	3,285,713	3,003,273	+ 282,440	Ord. Stk.	17½	6	14	Nil
	Buenos Ayres Central	190	27.2.37	$157,200	+ $75,600	35	$5,080,000	$4,015,400	+ $1,064,600	Mt. Deb.	31½	11	38	Nil
	Buenos Ayres Gt. Southern	5,084	13.3.37	205,955	+ 50,315	37	5,413,169	4,816,960	+ 596,209	Ord. Stk.	31¾	13¾	33½	Nil
	Buenos Ayres Western	1,930	13.3.37	55,521	+ 3,993	37	1,773,526	1,637,746	+ 135,780	,,	29¾	11	30	Nil
	Central Argentine	3,700	13.3.37	131,346	+ 61,599	37	5,599,506	4,479,717	+ 1,119,789	,,	32 9/32	8¾	32½	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	21	4½	17½	Nil
	Cent. Uruguay of M. Video	273	6.3.37	42,863	— 234	36	448,140	386,753	+ 61,387	Ord. Stk.	7¾	3	12	Nil
	Do. Eastern Extn.	311	6.3.37	2,852	+ 95	36	43,004	72,053	+ 10,951	—	—	—	—	—
	Do. Northern Extn.	185	6.3.37	1,801	+ 79	36	57,912	50,364	+ 7,548	—	—	—	—	—
	Do. Western Extn.	211	6.3.37	923	— 195	36	37,509	31,941	+ 5,568	—	—	—	—	—
	Cordoba Central	1,218	13.3.37	28,410	+ 4,200	37	1,176,850	1,059,000	+ 117,850	Ord. Inc.	5	1	5½	Nil
	Costa Rica	188	Dec., 1936	19,353	+ 7,331	26	110,934	80,721	+ 30,213	Stk.	36½	32	37	5⅓
	Dorada	70	Jan., 1937	15,300	+ 2,000	5	15,300	13,300	+ 2,000	1 Mt. Db.	107	101½	104½	5¾
	Entre Rios	810	13.3.37	11,371	+ 1,881	37	483,589	408,247	+ 75,342	Ord. Stk.	17	6	18	Nil
	Great Western of Brazil	1,082	13.3.37	7,300	— 2,300	11	93,700	108,500	— 14,800	Ord. Sh.	½	1/16	½	Nil
	International of Cl. Amer.	794	Jan., 1937	$516,579	+ $15,044	5	$516,579	$501,535	+ $15,044	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	½	-/6	½	Nil
	La Guaira & Caracas	22¾	Feb., 1937	4,925	+ 700	9	11,195	8,650	+ 2,545	Stk.	9	3	7½	Nil
	Leopoldina	1,918	13.3.37	25,325	+ 7,478	11	234,271	193,061	+ 41,210	Ord. Stk.	10½	3½	7½	Nil
	Mexican	483	7.3.37	$308,700	+ $47,500	10	$2,896,100	$2,413,600	+ $482,500	,,	1¼	¼	1	Nil
	Midland of Uruguay	319	Feb., 1937	8,320	+ 776	36	69,193	57,159	+ 12,034	,,	1½	1	½	Nil
	Nitrate	397	15.3.37	8,511	+ 1,896	11	38,301	35,969	+ 2,333	Ord. Sh.	63/6	41/9	21/16	Nil
	Paraguay Central	274	6.3.37	$2,801,000	+ $275,000	36	$95,626,000	$80,781,000	+ $14,845,000	Pr. Li. Stk.	85	71	81	7
	Peruvian Corporation	1,059	Feb., 1937	74,301	— 4,339	35	614,887	616,056	+ 28,831	Pref.	15	9	12⅞	Nil
	Salvador	100	6.3.37	¢43,000	+ ¢15,400	36	¢772,758	¢669,196	+ ¢103,062	Pr. Li.Db.	18	16	22½	Nil
	San Paulo	153¼	7.3.37	30,000	+ 53	10	283,489	274,224	+ 9,265	Ord. Stk.	86	46½	97½	29/16
	Taltal	164	Feb., 1937	3,440	— 1,130	35	27,930	28,485	— 555	Ord. Sh.	11532	14/-	11¼	8
	United of Havana	1,353	13.3.37	66,944	+ 16,813	37	864,383	786,429	+ 77,954	Ord. Stk.	3¼	1	4½	Nil
	Uruguay Northern	73	Feb., 1937	865	+ 61	36	8,461	6,528	+ 1,933	Deb. Stk.	5	3	9	Nil
Canada	Canadian National	23,566	7.3.37	763,398	+ 102,594	10	6,432,439	5,827,616	+ 609,823	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	—4 p.c.	Perp. Dbs.	76	51	70	5 11/16
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104¾	99¾	95½	4 3/16
	Canadian Pacific	17,223	7.3.37	526,600	+ 44,000	10	4,510,200	4,203,400	+ 306,800	Ord. Stk.	16¾	10 15/16	16	Nil
India,†	Assam Bengal	1,329	10.2.37	39,060	— 155	45	1,193,845	1,130,730	+ 63,115	Ord. Stk.	87¾	82¼	74½	4
	Barsi Light	202	20.2.37	3,742	— 285	45	102,517	127,627	— 25,110	Ord. Sh.	77½	65½	60	8 5/16
	Bengal & North Western	2,107	28.2.37	81,664	+ 4,717	20	1,208,203	1,163,938	+ 44,265	Ord. Stk.	319	292 5/8	315	5 11/16
	Bengal Dooars & Extension	161	28.2.37	2,198	— 1,157	46	120,113	129,579	— 9,466	,,	127½	118	104½	5¼
	Bengal-Nagpur	3,268	20.2.37	191,400	— 8,508	45	5,360,709	5,726,535	— 365,826	,,	104	100¼	95½	4 3/16
	Bombay, Baroda & Cl. India	3,072	10.3.37	305,925	+ 33,375	47	8,329,950	7,847,400	+ 482,550	,,	114	110½	111½	5⅛
	Madras & Southern Mahratta	3,229	20.2.37	158,100	— 3,122	45	4,969,654	4,788,404	+ 181,250	,,	116½	108½	105½	7 9/16
	Rohilkund & Kumaon	572	28.2.37	15,708	— 1,927	20	237,726	230,023	+ 7,703	,,	311	286	314	5½
	South Indian	2,532	10.2.37	110,000	+ 1,996	44	3,458,709	3,391,966	+ 66,743	,,	107½	102 5/16	101½	5 7/16
Various	Beira-Umtali	204	Jan., 1937	62,738	+ 1,539	17	268,806	254,392	+ 14,414	—	—	—	—	—
	Bilbao River & Cantabrian	15	Jan., 1937	1,036	— 282	5	1,036	1,318	— 282	—	—	—	—	—
	Egyptian Delta	620	28.2.37	5,280	— 270	46	234,017	231,895	+ 2,122	Prf. Sh.	2¼	1⅝	1⅝	Nil
	Great Southern of Spain	—	—	—	—	—	—	—	—	Inc. Deb.	1½	1⅛	3½	Nil
	Kenya & Uganda	1,625	Feb., 1937	274,358	+ 24,224	9	563,494	483,510	+ 79,984	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50½	37	46	7 5/8
	Mashonaland	913	Jan., 1937	116,140	+ 18,269	17	489,820	410,904	+ 78,916	1 Mg. Db.	101½	101 5/16	107	4 11/16
	Midland of W. Australia	277	Jan., 1937	12,814	— 2,014	31	94,868	98,451	— 3,583	Inc. Deb.	97	93½	96	4⅛
	Nigerian	1,905	23.1.37	64,568	+ 4,901	43	1,960,227	1,528,569	+ 431,658	—	—	—	—	—
	Rhodesia	1,538	Jan., 1937	210,786	+ 30,327	17	875,434	756,444	+ 118,990	4 p.c. Db.	107	103½	109	3 11/16
	South Africa	13,263	20.2.37	598,467	+ 17,066	47	28,641,964	26,712,702	+ 1,929,262	—	—	—	—	—
	Victoria	4,728	Nov., 1936	868,988	+ 45,953	21	3,995,540	3,959,297	+ 36,243	—	—	—	—	—
	Zafra & Huelva	112	Dec., 1936	16,027	+ 5,302	52	113,343	134,754	— 21,411	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rates of exchange and not on the par value.

Diesel Railway Traction

Standard Railcar Designs

STANDARDISATION of any equipment rarely has the blessing of the inventor or the idealist, but it confers certain benefits on the balance sheet which have not been overlooked by the railways. Construction of railcars to standard designs on a much wider basis is advocated elsewhere in this issue by an engineer with experience in meeting the needs of many small private railways abroad, but his remarks are intended equally for British railways and British industry. If railcar traction was to be introduced on a much larger scale in this country (and it is surprising that this has not been done already) there is ample room for two or three standard makes, which, by mutual consent, might be of different powers and capacities to obviate cut-throat competition, and to give the railways and the public the best possible vehicles at the lowest possible cost and at the earliest possible moment. Moreover, from the manufacturing point of view, such details as bogies and engines would be by no means inapplicable to vehicles built for export. The fetish for peculiar conditions necessitating peculiar vehicles has been somewhat overdone, and one need only point to such examples as the cars with virtually the same bogies and bodyframing and identical engines and transmission which are spread over Hungary, Egypt, Argentina and Spain, to see upon what a broad basis standardisation may be undertaken. The effect on first cost is of prime importance, for interest and depreciation charges usually form the largest single item in a railcar expense sheet. But maintenance and repairs are often a close second, and, more particularly in labour charges and in time wasted waiting for spare parts, a standard type of vehicle shows up to advantage. On certain railways full benefit has been taken of this by stabling all the cars of one make at one depot, and thus both drivers and fitters become more efficient and the amount of equipment is reduced.

The Purpose of Railcars

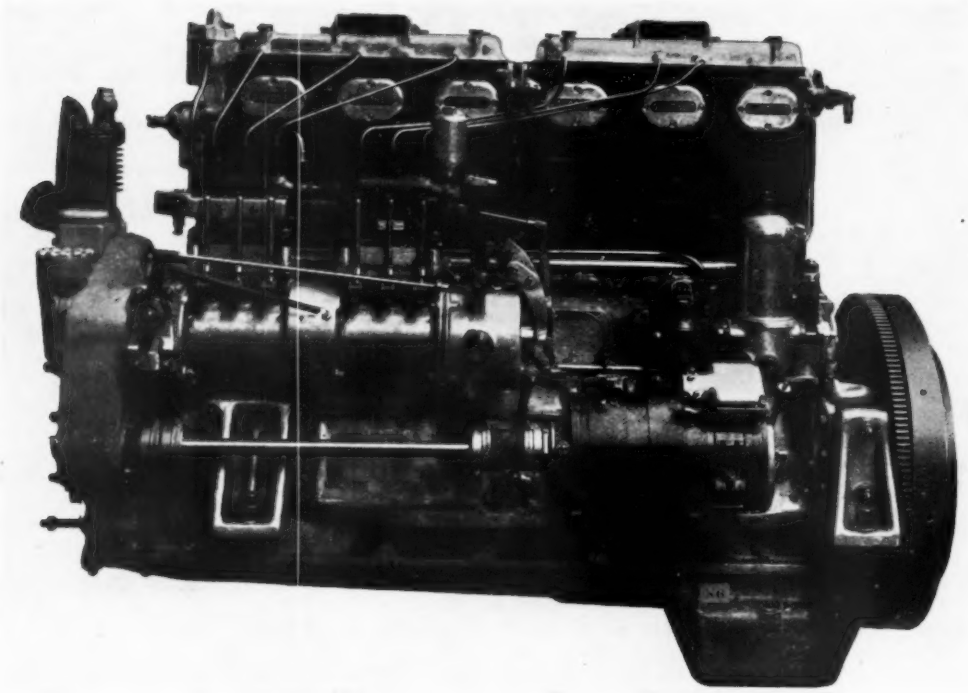
ALTHOUGH it may embody much that is of the greatest technical interest, a railcar is primarily a revenue earner for its owner, and if it does not earn money within a very short space of time it is apt to be the last of its line, even though its behaviour may have been exemplary. The cause of any inability to earn money may not lie at its door, but that will not save it, for it cannot speak for itself. It must earn money by a reduction in gross operating expenditure, by an increase in traffic which will bring an increase in net revenue even though the expenditure may rise, or by a combination of increased traffic and reduced expenditure. The increased traffic (if any) which it carries, must be an increase to the railway as a whole, and not merely a transference from the Stygian atmosphere of such steam trains as may be retained. There is evidence to show that such a transfer is not unknown in several countries. There is evidence also that a proper preliminary study of the routes concerned and the characteristics of the railcars to work over them have rarely failed to bring more money to the coffers, and at the same time to get one over road traffic interests, a procedure which appears to bring peculiar pleasure to railway circles in general. When introducing railcar traction there seems no obvious reason to impose the most difficult and least remunerative conditions by dotting odd cars all over the system to see how they work under different conditions of light and shade. If failures occur through the choice of a bad design or by reason of unsympathetic treatment, it is not wise to lay the blame on railcars generally. There are too many successful railcars of various makes at work under all conceivable conditions to keep suspicion away from a railway with unsuccessful vehicles. Railcars can fulfil a definite purpose and their possibilities over any given route can be predicted with some accuracy if the principles of sound railway working are followed. There has been a tendency in certain instances to regard a railcar as a toy to be tinkered with by the mechanical department, perhaps a relic of the days when a railcar *had* to be tinkered with, just as George Stephenson and his assistants spent some time in tinkering with the *Rocket*. A strong-minded traffic chief might insist on railcars working (within a specified time) certain traffic which his calculations had shown to be possible. He might also leave the how and why of the equipment and its details to the department concerned, although giving *definite* requirements as to what the car must do. In other words, he could concentrate on results and leave the methods of producing the correct machine in other hands.

Transmissions and Engine Speed

THAT the rotational speed of an engine is a primary factor in the weight and proportions of that constituent and of the transmission (of whatever type) is generally realised so far as railcar practice is concerned, for it is here that weight reduction is at its greatest premium. But in low-speed and inexpensive shunting locomotives, where weight is generally required for adhesion, the fairly high-speed engine still has some advantages. Usually it is considered that a heavy low-speed engine will assist in producing the weight required, and while further complications may not ensue in the most powerful machines there is a range—roughly up to 200 b.h.p.—in which the transmission is not all that can be desired if engines running at 450 to 750 r.p.m. are used. Especially is this the case with mechanical transmission, where a low engine speed may mean a 1·0 to 1 top gear and 1·0 to 1 ratio from first gear to the jackshaft. This means large torques and consequently large diameter shafts, and although it is possible that the increased weight may not be disadvantageous, the extra cost of larger bearings (plain or roller) and the bigger gearbox and reversing gears is not a happy corollary. It is probably in the loco-tractor type of machine, say up to 75 b.h.p., that this disadvantage is felt most seriously, for in such machines, weighing from 6 to 15 tons, there is no difficulty in getting the required adhesion weight even with light-weight engines. Moreover, it is in just these sizes that competition is keenest, and every avenue must be explored to cut down the cost of raw materials and of manufacture. In the range being considered the cost between high-speed and low-speed engines is not of great magnitude and may be more than made up in the cost of the transmission, whether this be of the mechanical, electric, or hydraulic pattern. Mainly for these reasons there is a tendency to use light-weight quick-running engines for small shunting locomotives, and speeds of 1,400 to 1,500 r.p.m. are not uncommon.

GARDNER 100 B.H.P. RAILCAR DIESEL ENGINE

A description of a design which is now being considered as a standard on certain railways in different countries



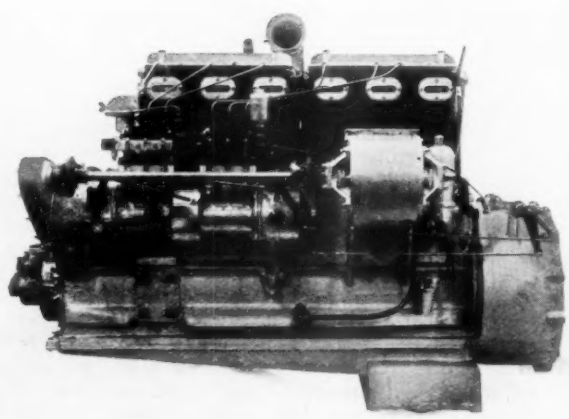
Gardner 6LW engine as used for railcar applications

THE Gardner engine was the first British oil engine to meet with any success in transport work, but although it was rapidly adopted for road vehicles it was not until about 1934 that more than isolated examples were used for railcars. Nevertheless, it is the only oil engine which has twice been ordered in batches of 100 for railway service, first for the Belgian National Light Railways (issue of this Supplement for January 25, 1935), and secondly for the Drewry cars now being built for Argentina.

Since its inception in 1929, the Gardner light-weight engine has built up a reputation as the "Rolls-Royce" of small oil engines, and only last month Mr. H. R. Ricardo, who has been able to follow its performances as an independent authority, commented on "its magnificent mechanical design, exceptionally high thermal efficiency, and the meticulous care with which it is manufactured." The mechanical design is notable for its simplicity, a detail example of which is the direct injection of the fuel, a system which was perfected in the last decade and has been used ever since.

Two Railway Types

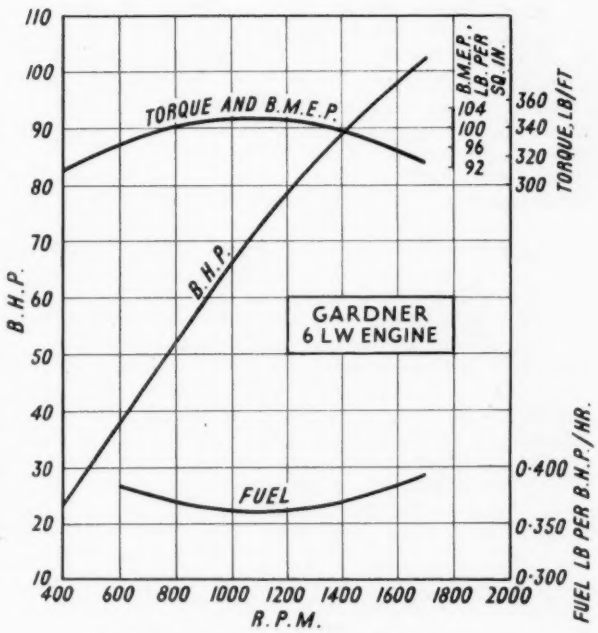
Two types of Gardner engine are used in railway work, viz., the L2 and the LW, the LW being the later design and that more generally applied nowadays for railcars, although the L2 type, made in powers up to 204 b.h.p. compared with the present limit of 102 b.h.p. for the LW design, is still used for locomotives and for cars above the capacity of the LW range. The cylinders of both models are 4·25 in. bore by 6·0 in. stroke, but the normal top speed of the L2 is 1,200 r.p.m. compared with 1,700 r.p.m. of the LW. It is the 6LW model, developing a maximum of 102 b.h.p. at 1,700 r.p.m. at sea-level, that is the subject of this article, although, of course, most of the particulars apply to the remaining models of the LW range. It is the LW engine which is being used



Gardner engine with a continuous rating of 90 b.h.p. as used on the Belgian National Light Railways

in the Argentine cars, and it is installed also in railcars operating in Ireland, Queensland and Cuba, and in the cars of the Belgian Vicinaux. Slight differences exist between the LW engines as made four to five years ago and the present models, as may be seen by comparing the illustration of the engines for Belgium (year 1934) and the latest type.

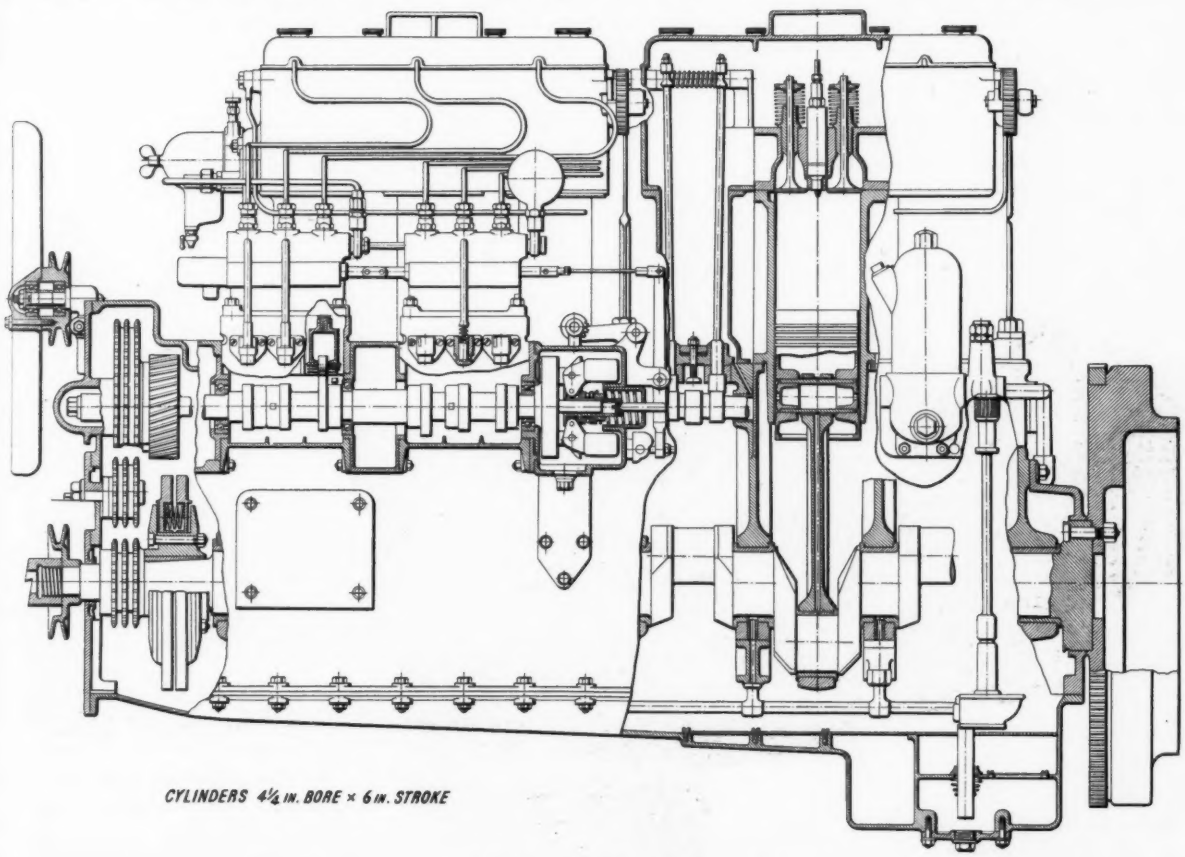
As a continuous output the 6LW engine is rated at 90 to 96 b.h.p. at 1,400 to 1,600 r.p.m. according to the exact nature of the duty to be fulfilled. From the fuel consumption and torque curves reproduced herewith, it will be seen that the torque reaches its maximum (348 lb.-ft.) at 1,000 r.p.m., and the fuel consumption reaches its minimum (0·37 lb. b.h.p. hr.) at 1,100 r.p.m. It is noteworthy that over the range of continuous output the fuel consumption is well below 0·4 lb. per b.h.p. hr., and assuming fuel of 19,000 B.Th.U.'s per lb., gives a brake thermal efficiency of 33·5 per cent. At full working rating the torque is beginning to drop off rather quickly and the fuel consumption to rise. At a rating of 98 b.h.p. at 1,600 r.p.m. the piston speed is 1,600 ft. per min. and the brake m.e.p. 95 lb. per sq. in. Without dynamo and the electric starting motor the weight of the engine is 1,450 lb.; with these auxiliaries the weight is equivalent to about 15 lb. per b.h.p. on the top rating, or about 16 lb. on the continuous rating.



Fuel consumption, b.h.p. and torque curves

Constructional Details

The cylinder blocks of the LW engines are cast in twos or threes, of special cast iron, the 6LW engine having two blocks of three cylinders each, bolted to a one-piece crankcase of aluminium alloy or Elektron. Steel bridge plates stretch across the crankcase and carry the main bearings. The bottom of the crankcase is closed by a sump cast of Elektron and fitted with oil strainers.



General arrangement of Gardner 6LW engine running at 1,700 r.p.m.

Hardened liners of the dry type are inserted in the cylinder barreis. The cylinder heads are cast of iron in blocks to correspond with the cylinder castings; they incorporate a chamber at the top in which are housed the valves, rockers, fuel sprayers and decompression rods, and the whole lifts off as one assembly. A light-metal casing goes over the tops of the cylinder heads.

Light-alloy pistons carrying four compression, one scraper and one oil return rings are used; they have a deep concave depression in the crown and weigh 5·313 lb. Attached to the pistons through fully-floating gudgeon pins of 1·625 in. diameter are nickel steel connecting rods of I-section with a hole drilled down the centre for the pressure lubrication of the bronze-bushed small end. Gudgeon pin and connecting rod forging weigh 2 lb. The big ends have detachable shells lined with white-metal. The nickel-alloy steel crankshaft is cut from a solid forging and machined all over; both shaft and pins are hollow-bored and the shaft is carried on seven plain bearings of 3·25 in. diameter.

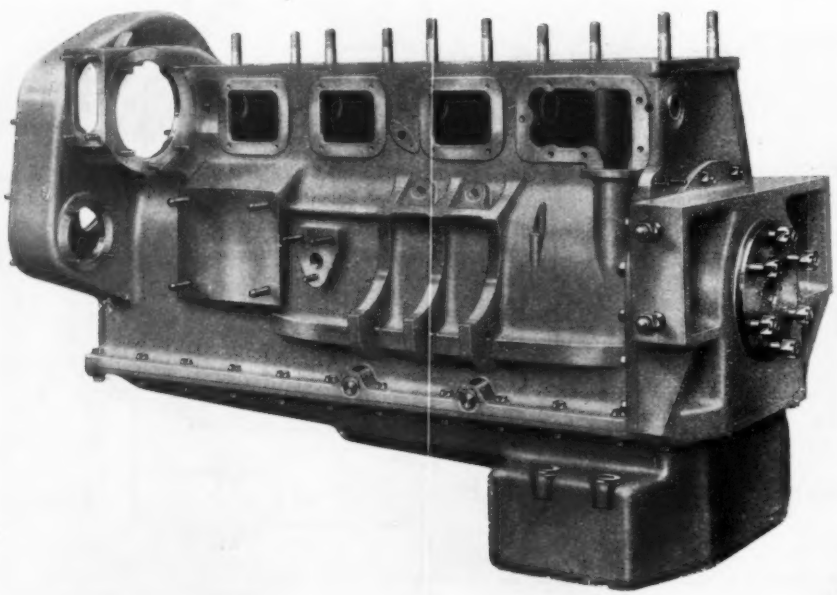
The camshaft is driven from the crankshaft by a triple-roller chain at the end remote from the flywheel and operates the valves through long push rods and rocker arms. The inlet and exhaust valves are opened against duplex helical springs and their location is arranged to produce a certain amount of turbulence. Gardner's own hand-operated decompression gear is arranged to lift the valves of each three-cylinder block, in order to provide easy starting by hand or electricity without the necessity of glow plugs. With the electric method the 12-volt motor takes a momentary current of 350 amp. Against the heads of each three-cylinder block is a small decompressing handle which on being moved through 90 deg. stops the inlet valves from closing and prevents compression. A turn through a further 90 deg. when the engine is being cranked round slowly alters the inlet valve timing and allows the valve to close, giving normal compression and heating the cylinders up quickly.

Fuel and Lubricating Systems

Fuel injection is by two three-ram C.A.V.-Bosch pumps operated from a small camshaft driven by gears from the main camshaft. These pumps force the fuel at a pressure of about 2,500 lb. per sq. in. through the special Gardner fuel injectors, which comprise a spring-loaded hollow piston running in a cylinder and terminating in a needle valve resting on a conical seat. Both valve and seat are of hardened steel. The valve is lifted from its seat during injection by the fluid pressure generated by the pump. There is an automatic timing gear to advance or retard the beginning of injection and it is operated from the governor to be in proportion to the speed; the range of advance is 8° from the idling speed of *circa* 400 r.p.m. to the maximum speed of 1,700 r.p.m. The compression ratio is 13 : 1, this low value being possible because of the direct injection; this ratio gives a normal compression pressure of about 450 lb. per sq. in., and the maximum cylinder pressure is in the neighbourhood of 700 lb. per sq. in.

Great care has been taken in the Gardner engine to filter properly the fuel, lubricating oil, and induction air, and to these precautions must be attributed part of the success, for it is not generally appreciated what wear can be occasioned by particles of foreign matter not exceeding one-thousandth of an inch in measurement in the fuel. Nor does it appear to be realised how many opportunities there are for foreign matter of much greater dimensions to enter the fuel before the point of injection. Normal Gardner installations comprise a filter between the fuel service tank and the engine and a combined strainer and fuel warmer attached to one of the cylinder heads.

Oil for lubrication is forced through the system by a submerged gear-driven pump and is delivered to the main and big end bearings, the gudgeon pin, valve mechanism and fuel pump cams and rollers. This oil finds its way back to the sump after use, and is again entrained by the pump, but in certain railway installations the cooling of the oil in the largest sizes of Gardner engines is effected in an external radiator. The normal maximum lubricating oil pressure is 35 lb., and if this pressure should be exceeded there is a bye-passing arrangement which comes into action and spills the excess oil over the timing gears. Adequate filtering equipment is provided on the suction and delivery side of the pump. Visco air filters are used very extensively with Gardner engines, and consist of two removable filter cells containing Visco ferrules of large dust-holding capacity which can be washed easily.



Light alloy crankcase of 102 b.h.p. Gardner 6LW engine. The sump also is of light metal and is detachable from the crankcase. The illustration shows the brackets and facings for the dynamo and governor casing and the housing for the timing gear

BRAKING OF HIGH-SPEED TRAINS

Summarised results of tests on 450-ton diesel-electric train

IN the issue of this Supplement for March 20, 1936, we were able to give some notes on the braking characteristics and performance of the Burlington Zephyr trains from speeds of 100 m.p.h. and upwards. Since that time braking tests have been made on the Union Pacific Railroad's 11-car 2,400 b.h.p. streamlined diesel-electric train City of San Francisco (July 10, 1936 issue of this Supplement), and for the following information on the results obtained we are indebted to our American contemporary, the *Railway Mechanical Engineer*.

With the exception of four test stops on measured sections, all stop distances were estimated from records made of the initial speed of the train, the brake-valve manipulation, the general functioning of the Decelakron (the retardation controller of the New York Air Brake Company), and the approximate location of the stop in regard to mile posts. The stopping time was also obtained by several observers by means of stop watches.

The wheels on all of the vehicles were made of rolled steel, oil quenched and drawn to a Brinell hardness of between 275 and 285. The brake shoes were all plain or non-flanged types and had a Brinell hardness of 300. On the power trucks, $3\frac{3}{8}$ in. by 11 in. shoes with an area of 37·125 sq. in. were used. On the car trucks, $3\frac{3}{8}$ in. by 9 in. shoes with an area of 30·375 sq. in. were used. The braking ratio averaged 222 per cent. for the power trucks, and 250 per cent. for the trailing-car trucks, both based on a brake-cylinder pressure of 100 lb. The overall braking ratio during the test run was 238 per cent.

The first series of tests were slow service electro-pneumatic applications with the brake valve lapped when the Decelakron first operated. During this series of tests, the Decelakron was set at 2 m.p.h. per sec. in slow service (under 35 lb. brake-cylinder pressure); 2·5 m.p.h. per sec. in high service (over 35 lb. brake-cylinder pressure); and 3 m.p.h. per sec. in emergency. All of these rates were the values with the Decelakron wide open. No high rates of deceleration were apparent during this series, and therefore the Decelakron setting was raised approximately 0·5 m.p.h. per sec. This setting resulted in too high rates of deceleration as evidenced by the fact that a brake-cylinder pressure of 95 lb. was obtained on tests at 60 m.p.h. and over; in these cases venting did not occur until the speed had dropped to about 20 m.p.h. This venting was too late to prevent a rate of deceleration near the end of the stop of about 4 m.p.h. per sec.

In order to demonstrate the effectiveness of train control, two applications were made; one by exceeding the speed limit, and one by failing to acknowledge a change in indication. The equipment worked as intended during these tests, but the retardation rate near the end of the stop was as high as 6·5 m.p.h. per sec. During these train-control applications the hunch on the brake valve was broken manually at the proper time. This manual hunch was necessary because the brake-valve handle was left in release position, at least for the major part of the stopping time, in order to simulate a condition when the engineman is incapable of proper response.

No complete series of tests were made under any one condition of brake-valve manipulation and Decelakron setting. For this reason it is impossible to draw accurate conclusions as to relative stopping distances obtained under each of the test conditions. The average rate of retardation was approximately 2·8 m.p.h. per sec. during all the stops. The tests during which the brake valve remained in service throughout the stop give higher rates than when the brake valve was lapped. Automatic full service applications resulted in a maximum retardation of 4·2 m.p.h. per sec. Train-control applications gave somewhat higher values, the rates of retardation being 6·5 to 5·7 m.p.h. per sec. When the Decelakron was set at its original values of 2 m.p.h. per sec. for low-pressure service, 2·5 m.p.h. per sec. for high-pressure service, and 3 m.p.h. per sec. for emergency service, the average rate of retardation during the stops was approximately 2·25 m.p.h. per sec. with a maximum of 2·75 m.p.h. per sec.

The maximum brake-shoe temperature recorded was 380 deg. F. The wheel-surface temperature, after the high-speed stops showed a maximum value of 360 deg. F. The records of wheel and shoe temperatures were not taken on all of the tests, and therefore the values just given may have been exceeded on several occasions. The records taken were obtained after high-speed stops and should represent values which would be expected in service. A small amount of metal was found bonded to the wheels after the high-speed stops, but it was not enough to cause any noticeable roughness. The brake shoes were practically unworn at the start of the tests. After the tests the shoes showed very little wear, and did not have complete bearing areas over the wheel tread.

The Decelakron control tended to reduce high rates of deceleration, and in general performed this function satisfactorily. However, on several of the stops, particularly when the Decelakron setting was at the higher values, this device did not entirely prevent the build up of high retardation rates near the completion of the stop.

STOPPING TESTS ON UNION PACIFIC DIESEL-ELECTRIC TRAIN, CITY OF SAN FRANCISCO.

Grade at stop, per cent.	Initial speed, m.p.h.	Stop time, sec.	Stop distance, ft.	Stop distance corrected for grade, ft.	Retardation, m.p.h. per sec., max.	Shoe temp. deg. F., on truck No.	
						4 rear	5 rear
0	77·7	43·8	2,732	2,732	2·2	—	—
0	87·9	37·0	2,716	2,716	5·5	340	380
— 0·14	84·9	43·3	3,128	3,070	3·5	250	220
— 0·15	88·5	43·7	3,460	3,390	7·0	360	285
— 0·18	82·6	36·2	2,505	2,463	5·0	—	—
— 0·05	83·1	36·5	2,585	2,570	7·0	—	—
— 0·24	61·4	28·6	1,592	1,642	—	240	250

A NEW GEARBOX DEVELOPMENT

Double-end drive a feature of a Continental mechanical transmission

A NEW type of gearbox has been evolved by the Triebwagenbau A.G., of Kiel, for application to diesel railcars, more particularly those with bogie-mounted engines and transmissions. The principal feature of the box is that it is mounted transversely in the bogie frame structure and that it has a special form of double-end drive through which both axles can be driven directly, even though the distance between the box and the axle is very small. This type of transmission has been applied to a variety of cars with engines of 210 to 280 b.h.p. in Germany, Italy, and other countries. The standard arrangement of this drive in the usual type of bogie is shown in one of the accompanying illustrations (Fig. 3), from which it will be noted that installations can be made on metre gauge vehicles as well as on standard and broad-gauge cars. In principle there is no limitation to the number of speed steps which may be incorporated but most of the boxes built up to the present time have had four speeds.

Pneumatically-operated Clutches

The gears are of the constant-mesh type and the box is provided with two external clutches and a double inner clutch, *D, E, F, G*, respectively in the accompanying sectional arrangement drawing (Fig. 2), and the drive is taken to the two output shafts through the sequence of gears shown in the key. Each of the air-operated clutches corresponds to a particular gear, and as a rule no main clutch or hydraulic coupling is used. Advantage is taken of the possibility of locating the clutches for the first and second speeds outside the box and thus obtaining better cooling and accessibility in conjunction with optimum mechanical design. The air for the operation of the clutches for the third and fourth gears is passed down two passages drilled through the primary shaft, as is indicated in Fig. 2.

In clutches *D, F*, and *G* the inner plates have surfaces of Jurid friction material set to a slight taper, and the outer plates are of steel; in clutch *E* this order is reversed. The outer clutches, of course, run dry, and the inner pair, too, are not run in oil, for the lubrication of the gears is effected only by the splash of the slow-running gears at the bottom of the box dipping below the normal oil level. In one of the standard 280 b.h.p. four-speed boxes about 66 lb. of oil is carried. The clutches incorporate springs to keep the plates the proper distance apart during disengaged periods, and engagement is effected through large circular plates moved from side to side by air pressure, the air being supplied through rotating connections. Because of the limitations of space the engaging plate for the inside clutches is common to the two, and can be moved to either side of its central position and thus effects the engagement of the third or fourth speed respectively. With both inside and outside clutches adjustment is unnecessary up to the point where the friction material must be renewed, for an increase in the movement of the engaging disc takes place as required.

Control Arrangements

The design of the change-speed valve at the driving position eliminates any hand gear-changing, the only necessary operation being the movement of the small handle from notch to notch round a half circle, and the correct positioning of the reversing handle. The diagrammatic section of the box (Fig. 2) shows air piping and controls for double-end operation. The air from the compressor is pumped into a reservoir from which a pipe leads through a pressure reduction valve to the reversing and gear-changing switches, the latter having a neutral position and four speed positions, and the reversing switch neutral, forward and backward positions. The gears are engaged according to the corresponding position of the driver's handle, and it is not possible to engage more than one speed at a time. The driver's control valve has an air discharge opening between each two gear steps, so that the air from the clutch of the first is exhausted before the beginning of admission of air to the clutch of the succeeding step. Before the switch positions of the first and second gear steps in the change-speed valve are placed rapid-discharge valves, which have a small piston and a pressure-relieving hole. On declutching, the small control piston goes automatically to the limit of its stroke and allows the air to escape by the shortest route and without passing through the change-speed valve. On the other hand, when engaging, this device gives a slower increase in the building up of the air pressure, and thus gives a gentler engagement of the clutch.

The amount of air required for the gear clutch operations is approximately 12 litres (5·1 cu. ft.) of free air per min. for the first and second gear steps; 35 litres (14·8 cu. ft.) for the third step; and 52 litres (22 cu. ft.) for the fourth step. The normal clutch operating air pressure is 5·5 atm. (78-80 lb. per sq. in.). The compressor is of the three-cylinder single-stage type and is driven from a prolongation of the gearbox shaft carrying the clutches for the third and fourth gears; it supplies air for the brakes and any signalling apparatus or other auxiliary requirements, and is cut out when a pressure of 7·5 atm.

(*Continued on page* 572)

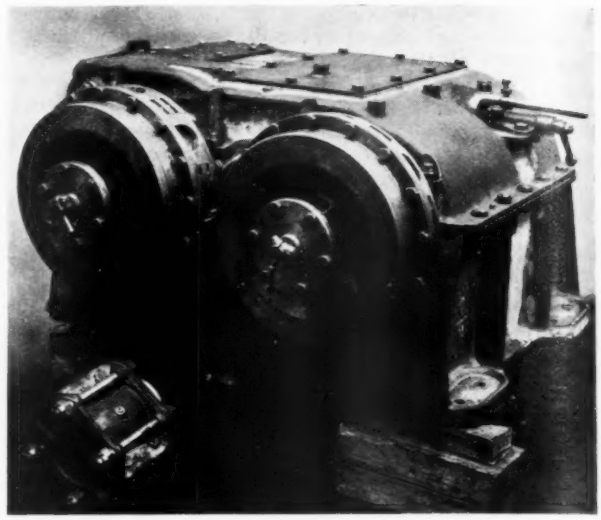


Fig. 1—T.A.G. four-speed gearbox with double-end drive. The box is bolted to the bogie frame structure through the intermediary of rubber blocks

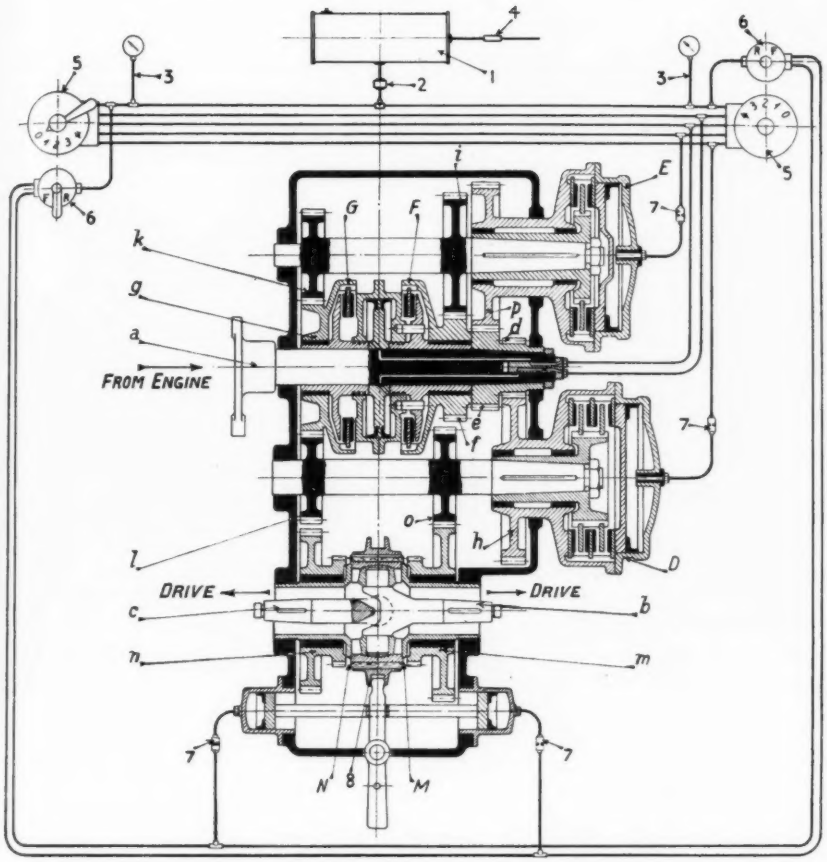


Fig. 2 (left) : Diagrammatic section of T.A.G. gearbox

Key to Fig. 2.

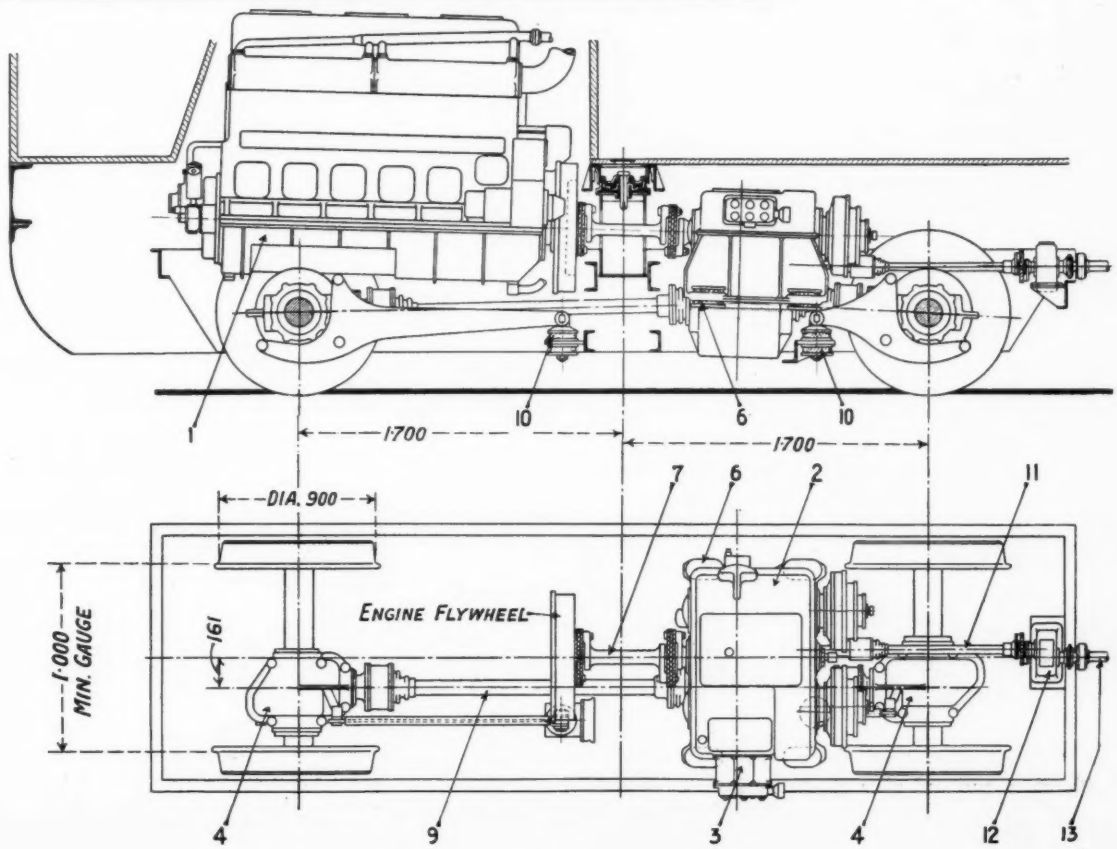
1. Special air container.
2. Reduction valve.
3. Air gauge.
4. Non-return valve.
5. Change-speed valve.
6. Reversing valve.
7. Reduction valve.
8. Reversing switch lever.

Forward Gear		
Gear step	Clutches	Wheels
1	*DM*	*adhomM*
2 ..	*EM*	*acpkglomM*
3 ..	*FM*	*afikglomM*
4 ..	*GM*	*aglomM*
Backward Gear		
1 ..	*DN*	*adhlgnN*
2 ..	*EN*	*acpkgnN*
3 ..	*FN*	*afikgnN*
4 ..	*GN*	*agnN*

Fig. 3 (below) : Arrangement of engine and gearbox in bogie

Key to Fig. 3.

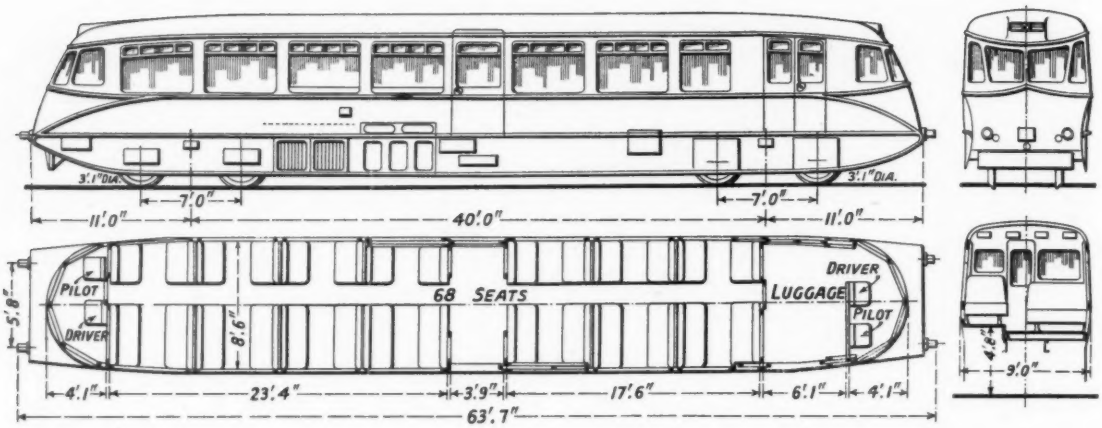
1. Engine.
2. Change-speed and reversing gear.
3. Compressor.
4. Axle drives.
6. Rubber pads for gearbox.
7. Shaft with flexible couplings.
9. Shaft to axle drive.
10. Torque-rod spring.
11. Shaft for fan drive.
12. Fan gear.
13. Flexible shaft to fan.



THE STANDARDISATION OF DIESEL RAILCARS

An epitome of the pros and cons

By DIPL.-ING. J. L. KOFFMANN



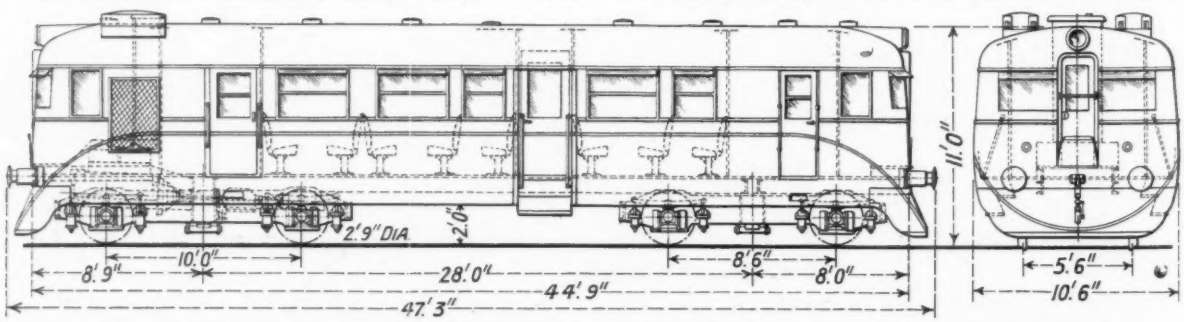
Standard 260 b.h.p diesel-mechanical car of the Great Western Railway; different seating and luggage arrangements are used

ALTHOUGH for a good many years the order of one diesel railcar was often considered as a courageous or foolhardy experiment, batches of 100 cars are now ordered from a single manufacturer at one and the same time. But taking the 3,000-odd diesel railcars in the world as a whole, there is scarcely one railway using the same type of car as its neighbour. Although this might be justified during the first stage of development it would not appear to be the best of policies at the present time, when there is little reason to proceed along the most expensive lines, and when vehicles to virtually the same design are operating under widely varying conditions. Actually, within a limited sphere, good progress has been made in the standardisation of cars, but in their applicability to different railways and different countries only French and Hungarian manufacturers have gone beyond the casual stage.

In the gross operating cost both maintenance and capital charges are big items, and it is in just these respects that cars to a standard design show savings. The accusation is frequently made that such a method would stultify progress, but a similar procedure has not retarded steam locomotive design taken as a whole.

It is admitted that nothing like finality has been reached in many phases of railcar design, but it is only the worst and most rigid type of standardisation which would allow of no improvements. If one were to wait for finality in design the question would be shelved for ever and a day. The steam locomotive is about 110 years old, and something approaching standard types have been in use for almost a century.

Despite the plea of quite different conditions on different, though neighbouring, railways, with which some railways officers have succeeded in discouraging new developments, there is really a close similarity in the requirements of various railways of one country, and often between those of one country and another, as regards length, permissible weight, seating and baggage capacity, top speed, and necessary power-weight ratio. There may be some differences in the type and arrangement of the seating and the doors, but not infrequently such matters have little to do with traffic requirements. Moreover, whatever the number or arrangement of seats and whatever the rules as regards trailers or extra cars, there will always be periods of overcrowding and periods when the vehicle runs almost empty. As a proof of the flexibility of one type of car it is only necessary to observe railcar operation in France, where cars to exactly the same design in all respects are used for slow stopping trains, semi-fast trains with sharp point-to-point bookings, and main line services



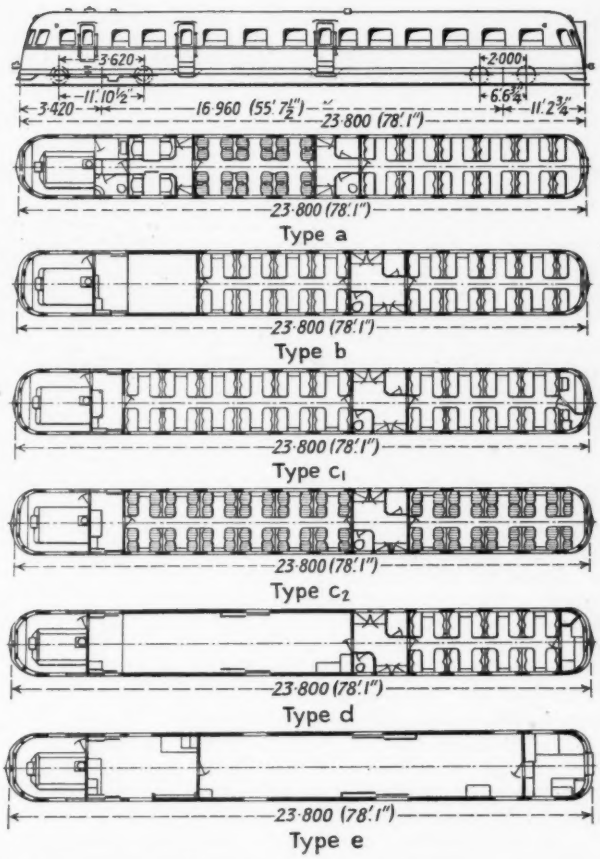
Elevation and end view of the 99 Drewry cars for Argentina which embody five different types of seating, with standard bogies and body details

up to 150 miles in length, and used with a great deal of success, too.

Nearer home, the A.E.C. cars on the Great Western Railway form another, though less marked, example, although they indicate the ease with which a different type of interior may be used in a standard body and with standard chassis and bogies. These cars indicate, too, that three designs embodying merely two types of underframe, an almost standard body, and two types of bogie would be sufficient to cater for a great majority of British requirements, for the 130 b.h.p. single-engined car working solo can look after branch line traffic; the twin-engined 260 b.h.p. car working solo would operate fast point-to-point services, e.g., the present Birmingham-Cardiff service; and the double-engined 260 b.h.p. car with a heavier underframe and standard buffing and drawgear would undertake trailer haulage.

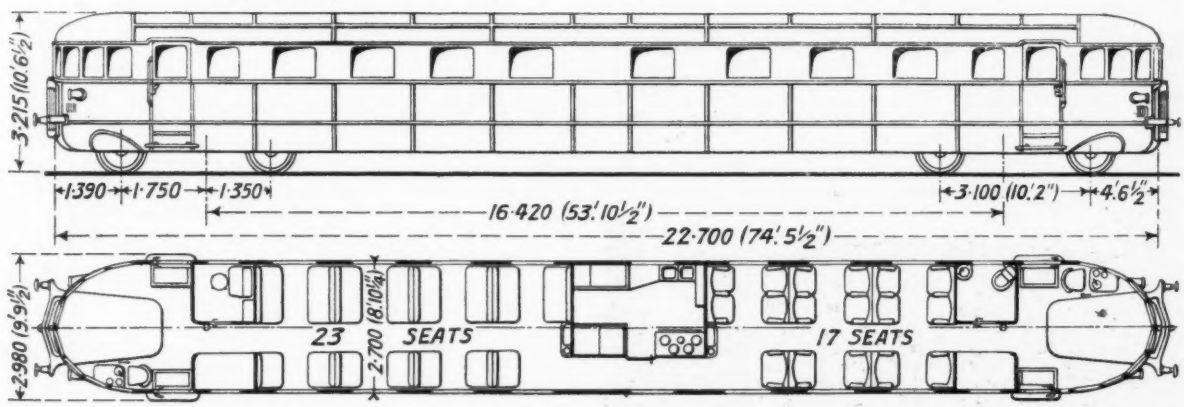
Standardisation would cover the whole car body so far as size, design, shape, doors, windows, lighting, heating and ventilation are concerned, and relative adjustments in the proportion of space available for seats and luggage could be made easily. Further, standard bogies, wheels, axleboxes, spring and brake gear, &c., can be used.

In certain countries it might be necessary to have standard four-wheeled and standard bogie cars should there be any special requirements imposed by grades, trailer traffic, market days, or lines which never will have anything but light traffic. In either of these types it is possible



Right : Six types of 240 b.h.p. Ganz cars for metre gauge lines of Argentine State Railways. Many details are common to all types

Below : The Fiat diesel Littorinas, of which over 100 with various arrangements of seating are used by the Italian State Railways



to mount the engine below the car floor and use a standard drive to the axles, and, to carry standardisation a stage further, the same engine can be used, one for the four-wheeler and two (one driving each bogie) for the eight-wheeled vehicle. Moreover, if it is considered that the time has not yet come to standardise one engine, it is not a superlatively difficult matter to standardise a mounting cradle and a definite arrangement of main and auxiliary drives, and even similar layouts to take either mechanical or partial-hydraulic transmissions.

But such a variety of conditions would be required only by a railway or in a country which had to sponsor a variety of national industries (*e.g.*, Germany), and in normal cases a definite engine and transmisson would be used, (*e.g.*, the 99 cars of the Buenos Ayres Great Southern Railway, with Gardner engine, Vulcan-Sinclair fluid coupling, and Wilson-Drewry gearbox).

The advantages of any such standardisation are obvious, for the cars may be "bought from the shelf" as is done now with all types of road vehicles, and also with many types of small diesel shunting locomotives. The standard car will result not only in reduced first cost, through manufacture on semi-mass production lines, with ensuing lower overhead and shop expenses, as well as in delivery at shorter notice, but the maintenance costs will be reduced, more particularly as far as labour charges are concerned. The number of spare parts in stock may be reduced, and here again delivery of any part required should be effected more quickly. Driving and trailing bogies would be interchangeable, and with a large number of cars to one design it would be a more economic proposition to keep in stock a few spare bogies, and change them in a short time when required, than with the present

(*Continued at foot of page* 572)

RAILCARS ON BAVARIAN SECONDARY LINES

Substitution for steam trains results in lower running costs and better service to the public

THE Regensburg divisional management of the German State Railway has been paying special attention during the last four or five years to the modernisation of services on the numerous secondary lines in the eastern part of Bavaria bordering Czechoslovakia, with a view to providing more attractive facilities and thus meeting road competition. Previously the services on these lines were infrequent and consisted mostly of mixed trains, with the result that passenger journey times were greatly lengthened by shunting at intermediate stations. Road transport had already begun to affect railway receipts seriously, and as most of the lines would in any case have had to be kept open to carry certain classes of traffic it was decided to try to regain as much of the lost passenger traffic as possible.

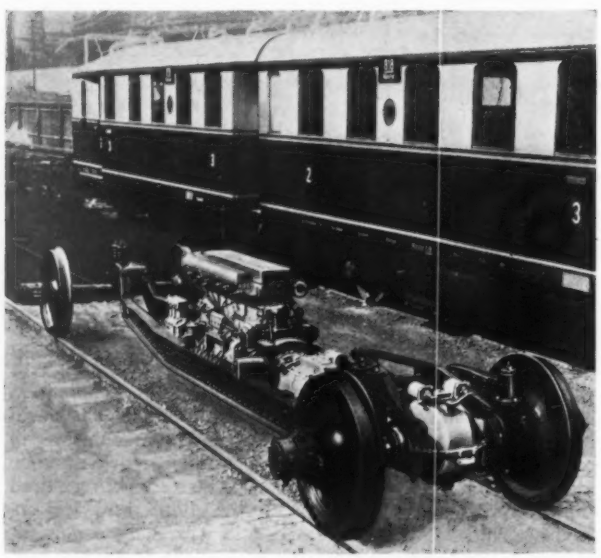
In 1932 railcar traction was introduced and gradually increased to the present total of 30 four-wheeled railcars, particulars of which are given in one of the accompanying tables. Apart from the Henschel cars, all haul a light four-wheel trailer, weighing about 9 tons, and having 53 third class seats. The b.h.p. per ton is relatively high, averaging 8·8, and the cars are able to attain speeds up to 44 km.p.h. (27·3 m.p.h.) on a gradient of 1 in 40, or with trailer, up to 28 km.p.h. (17·4 m.p.h.).

Engine Maintenance

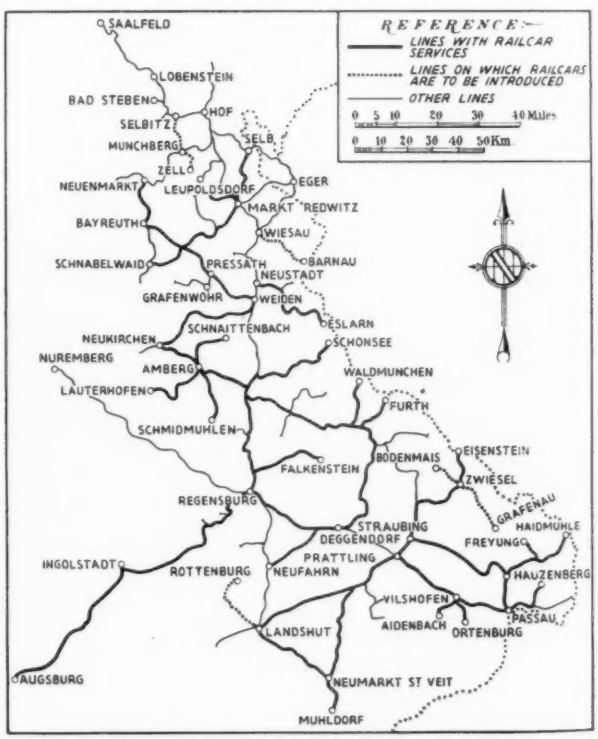
A certain amount of trouble was experienced at first with the engines, but the working has now become satisfactory. Simple construction, keeping mechanical stress and piston speed down, has been found to give the best results. The petrol engines run 150,000 km. (93,200 miles) between successive heavy overhauls and the diesel engines more than this. Occasionally it has been necessary to renew some part such as a bearing or cylinder head, but steps have been taken to alter the design of any part which was shown to be of faulty design. After running about 30,000 km. (18,640 miles) an examination is made, cylinder heads being removed, valves ground in and connecting rod bearings inspected and adjusted if necessary. New bearing metal is run in when the play has become too great. If care is taken in the beginning and during these examinations a long service can be obtained with these bearings, but skilled examiners are essential. The diesel engines now have steel shells and lead bronze linings, but in such bearings the minimum amount of play must on no account be exceeded. Correct lubrication is also of vital importance. By dismantling the rods, the pistons can be drawn out and their rings examined. Mechanical transmissions have proved quite satisfactory for these cars, and the electric system is not considered necessary, although a dozen of the vehicles have it. Some of the cars with Voith hydraulic drive, have exceeded 80,000 km. (49,710 miles) without failures.

Railcar Heating

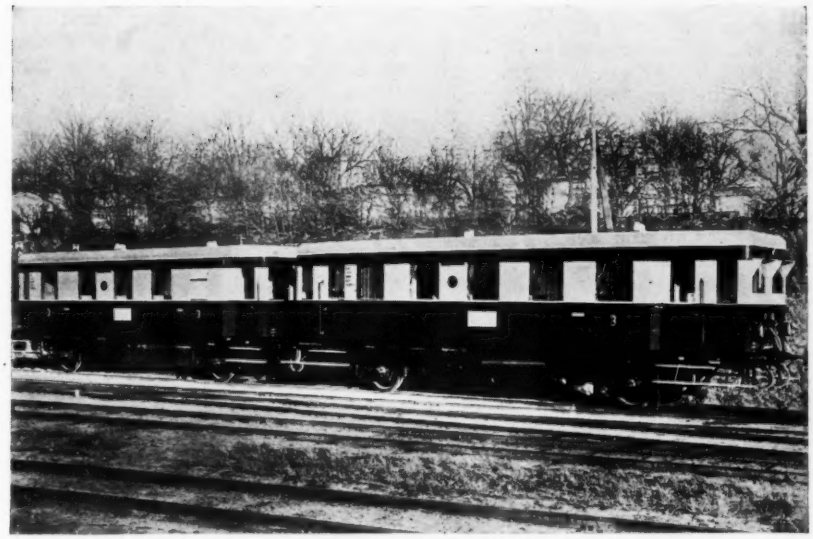
The superior accommodation of the railcars has found great favour with the public. Heating from the engine cooling system was found insufficient for car and trailer on long down-grade runs and an oil-fired boiler therefore has been adopted with satisfactory results. Full speed running on the straight has at times been accompanied by disagreeable oscillations; several measures are being studied with a view to improving the riding and it is considered advisable to return the tyres after running 70,000 km. (43,500 miles).



150-b.h.p. M.A.N. engined cars showing arrangement of engine and Mylius transmission



Map showing railcar services on the east Bavarian lines of the German State Railway



44-seater Maybach-engined railcar with light trailer as used on secondary services of the Regensburg division of the German State Railway

Of the total 2,150 km. (1,336 miles) of the Regensburg division 1,350 km. (839 miles) are provided with railcar services, as indicated on the accompanying map. Each route was carefully studied to give an estimate of the extent to which the cars could deal with the traffic and enable steam trains to be eliminated. For certain classes of goods, such as cattle, the latter are still necessary, but the more frequent railcar services enable most of the light goods to be conveyed by railcar, although the space available in each vehicle is not large. Bigger railcars would not have been an economic proposition. The journey times have been markedly improved and permission has been obtained to run faster on certain sections than was formerly allowed. The total length of the secondary lines in the division is 662 km. (411 miles) and the total journey time of the steam trains thereon is 1,603 min. and of the present cars 1,160 min. the average speeds being 24·8 km.p.h. (15·4 m.p.h.) and 34·2 km.p.h. (21·2 m.p.h.) respectively.

Mileage

The work done by the railcars has steadily increased, and is now 200,000 km. (124,275 miles) monthly, or about 18 per cent. of the total passenger locomotive-km. of the division. The average distance run daily per car is 335 km. (208 miles), but it must be remembered that on most sections the maximum speed permissible is 50 km.p.h. (31 m.p.h.). Failures of the cars have been largely eliminated, and reckoning those causing five or more minutes delay there is now one per 12,000 km. (7,456 miles). This is not as good as the figure for the steam locomotives,

TABLE II.—OPERATING COSTS OF FOUR-WHEELED DIESEL RAILCARS WITH TRAILERS AND SMALL STEAM TRAIN

Item	Running costs per km. in pfennigs	
	4-Wheeled diesel railcar, with trailer	Small steam train composed of 2-4-2 loco. and 2 cars
Fuel	5·60	12·50
Oil, glycerine, waste, etc.	1·70	1·40
Train crew (driving)	12·70	23·00
do. (guards)	7·80	7·80
Maintenance (sheds)	6·90	6·90
do. (repair shops)	10·90	12·60
Cleaning passenger stock	1·20	3·00
	46·80	67·20
Station service	8·70	8·70
Track renewal and maintenance	16·70	35·00
Total without interest charges	72·20	110·90
Interest on cost of rolling stock	6·70	— (8·50)
Depreciation of rolling stock	4·40	— (2·80)
Interest charges only for railcars, the steam stock being assumed to be written off. Figures in brackets give the corresponding charges	83·30	110·90 (122·20)

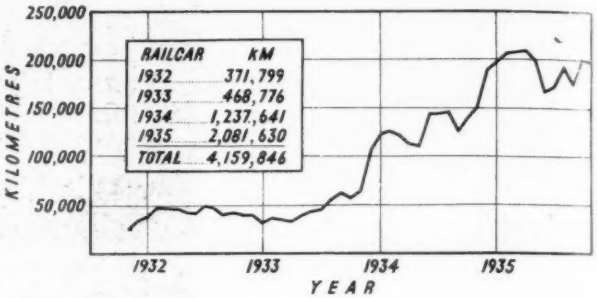
TABLE I.—PARTICULARS OF RAILCARS: REGENSBURG DIVISIONAL MANAGEMENT

Class No.	Running number	Builders of		No. in service	Tare weight, tonnes	No. of seats	B.h.p. of engine	B.h.p. per tonne	Transmission	Maximum speed, km.p.h.
		Engine	Body							
1	133000–2	Vomag b (6 EH)	LHB	3	14·8	48	120	8·1	TAG mechanical	65
2	133003–5	Maybach b (OS 5)	Wumag	3	13·5	44	100	7·4	Mylius do.	65
3	133006–8	Henschel b (D)	Henschel	3	11·5	46	100	8·7	ZF do.	60
4	135000–1	Daimler ö (OM 54)	Westwaggon	2	15·5	45	135	8·7	SSW electric	65
5	135012–21	MAN ö (W 6 V 15/18)	MAN	10	17·4	41	150	8·6	BBC do.	70
6	135048–50	MAN ö (W 6 V 15/18)*	MAN	3	17·3	44	200	11·6	Voith (hydraulic)	75
7	135055–59	Daimler ö (OM 54)	LHB	5	15·5	45	135	8·7	TAG mechanical	75
8	135060	DWK ö (2 × 4 V 18L)†	LHB	1	16·2	46	180	11·1	do. do.	75

* Supercharged. † Horizontal engine. b = petrol engine. ö = diesel engine.

but some cars have given excellent results. The proportion of them under examination or overhaul is also higher than with the steam locomotives, but this is understandable, as they are of various types, which causes delay in obtaining and fitting spare parts. An accompanying table gives an interesting comparison between the performance of locomotives and railcars in 1936, but more locomotives would have to be provided to obtain the same service as the cars now render.

The costs of train working have been improved steadily by better organisation and instruction of the staff, and the last of the accompanying tables gives a comparison between railcars and steam trains of equal seating accommodation. A saving of 25 per cent. in working costs compared with steam has already been obtained and an increase in the number of cars and the running of special light goods trains hauled by railcars would be justifiable. The authorities are now considering the extension of the railcar services to additional routes as shown on the map, in view of the satisfactory results. The above particulars are taken from an article in *Die Reichsbahn* by Herr Scharrer and Dr. Friedrich.



Above: Diagram showing monthly kilometrage of diesel railcars operating in the Regensburg division of the Reichsbahn

TABLE III.—COMPARISON BETWEEN SERVICES PERFORMED BY CERTAIN LOCOMOTIVES AND RAILCARS, REGENSBURG DIVISION, GERMAN STATE RAILWAY, 1936

Type	Yearly service in km.	Average number locomotives or cars		Km. run by locomotives or cars	
		Provided	At work	Scheduled	In actual service
Loco. Pt. 23.14	1,559,774	31	24	50,315	64,990
Loco. L.44.11.12	1,468,591	36	29	40,794	50,641
Loco. L. 45.11	1,025,282	18	14	56,960	73,234
Four-wheeled railcars	2,081,630	27	18	77,097	115,646

A New Gearbox Development—(*continued from p.* 566)

(107 lb. per sq. in.) has been attained. The drive is so arranged that the compressor speed is constant over a range of from about 80 to 100 per cent. of normal full load engine speed; below 80 per cent. the compressor speed is reduced in proportion.

Gear Steps and Reversing Gear

All the gears are mounted on their shafts close to the bearings in order to reduce the bending stresses, and in the case of wheels *p*, *d*, and *h* (Fig. 2) they actually form part of the bearing. The gears are of nickel steel, case-hardened and ground, and all the shafts run in roller-cum-ball bearings supported by the cast iron gearbox. In the standard box transmitting 280 b.h.p. at 1,500 r.p.m. engine speed as used for certain of the cars mentioned in the first paragraph, the gear ratios in the box are 6·6, 2·67, 1·5, and 1·0 to 1, and 10·3, 4·57, 2·65, and 1·7 to 1 including the reversing gear. Such a box weighs 1,360 kg. (3,000 lb.) empty and 1,485 kg. (3,275 lb.) complete with compressor, oil, and auxiliary drive, but without the ball-and-socket joint rods *b* and *c*.

Reversing is effected by air-operated dog clutches *M* and *N* which bring wheels *m* or *n* into mesh with the ball-and-socket driving rods *b* and *c*. Wheels *m* and *n* run loose on the hollow shaft which surrounds the driving rods. The reversing operation can be carried out only with the vehicle at rest. In order to disengage the gearbox from the axle drive and cardan shafts, and thus prevent possible damage through overspeed if the vehicle is being hauled, a hand-operated lever, 8, is provided at the side of the gearbox. The ball-and-socket joint of the driving rods ensures that even with a limited bogie wheelbase the length of the shortest cardan shaft will be sufficient. This double-end drive, of course, is an optional feature, and if only one axle is to be driven the joint and one cardan shaft will be eliminated. The usual T.A.G. axle drive with this type of gearbox incorporates a large disc forged integral with the axle and carrying the bevel teeth on the rim. These wheels are housed in a cast steel gearcase with torque reaction rods attached to a suitable part of the bogie frame through rubber springs.

Another auxiliary drive is taken from the gearbox in normal designs. This is the radiator fan drive, run from a special shaft between clutches *D* and *E*, and the drive of which is derived from the primary shaft of the gearbox. Where it passes the bogie headstock it is fitted with a stepping-up gear which increases the rotational speed to the order of 1·25 to 1. The top cover of the gearbox can be lifted off and a partial inspection of the gears made through a trap-door in the floor of the railcar.

Railcar Standardisation—(*continued from p.* 569)

method of having to keep spares for each of the numerous types. The handling of the cars at the sheds, at the repair depots, and by the drivers will improve also with all cars of the same design and equipment, and the number of special tools needed will be reduced.

The way towards an efficient and up-to-date railcar standardisation is probably in the appointment of an advisory committee representing the interests of operators and manufacturers, which, by the subscription of necessary funds, would be able to appoint a permanent staff in charge of a chief engineer, to make all the necessary preparations in testing out component parts and preparing the complete car design based on the practical experience and needs, and to the advice of those concerned. The first car so developed could be placed in service on lines with varying operating characteristics to try out its reliability and to make changes and alterations if necessary. Then the actual manufacture along semi-mass production lines could be begun.

LOG OF DENVER ZEPHYR'S RECORD RUN

12 hours non-stop at 83 m.p.h. at a fuel consumption of 1·28 gal. per mile

The 564-ton 12-car stainless steel Denver Zephyr with its full rake of 12 vehicles

THE 3,000 b.h.p. 12-car Denver Zephyr trains maintaining the fast daily service between Chicago and Denver have been accelerated in the eastbound direction from 15 hr. 50 min. to 15 hr. 45 min. for the 1,047·5 miles, corresponding to an average of 67·2 m.p.h. including eleven stops. In the westbound direction the time is still 16 hr. We have reported already the record westbound special run on October 23 last, when, over a slightly different route, a non-stop run of 1,017·2 miles was made in 12 hr. 12 min. 27 sec., giving an average of 83·3 m.p.h. By the kindness of Mr. E. F. Weber, of the Chicago, Burlington & Quincy Railroad, we are able to reproduce on this page a more detailed log of the run.

The top speed was 116 m.p.h., and from Otis, Colorado, to Barr, Colorado, the 107·05 miles were covered in 67 min. 55 sec. at a pass-to-pass average of 94·57 m.p.h.; the 26·6 miles between Bristol and Earlville, in the state of Illinois, were covered, pass-to-pass, in 15 min. 12 sec. at an average of 105 m.p.h. On this run only ten cars, including the two power cars, were used, the total train weight being 465 Engl. tons, and the power-weight ratio 6·5 b.h.p. per ton.

LOG OF DENVER ZEPHYR NON-STOP RUN, OCTOBER 23, 1936

Stations	Miles from Chicago	Schedule		Time from Chicago	Average speed from Chicago	Distance from previous station	Time from previous station	Average speed from previous station
		Proposed	Actual					
		CT	hr. m. s.	hr. m. s.	m.p.h.	miles	min. sec.	m.p.h.
Chicago	0·0	7.00 a.m.	7 00 00	— — —	—	—	— —	—
Halsted St.	1·92	—	7 04 35	— 04 35	25·13	1·92	04 35	25·13
Aurora	37·76	7·32	7 34 40	— 34 40	65·35	35·84	30 05	71·48
Mendota	82·65	8·04	8 03 50	1 03 50	77·69	44·89	29 10	92·35
Kewanee	130·95	8·37	8 37 15	1 37 15	80·79	48·30	33 25	86·72
Galesburg	162·23	8·59	8 56 05	1 56 05	83·85	31·28	18 50	99·65
Burlington, Iowa	205·42	9·32	9 28 45	2 28 45	82·86	43·19	32 40	79·33
Mt. Pleasant	233·18	9·53	9 51 50	2 51 50	81·42	27·76	23 05	72·16
Ottumwa	279·62	10·26	10 21 30	3 21 30	83·26	46·44	29 40	93·92
Chariton	334·32	11·10	11 06 40	4 06 40	81·32	54·70	45 10	72·66
Osceola	359·74	11·30	11 27 50	4 27 50	80·59	25·42	21 10	72·06
Creston	392·94	11·54	11 50 25	4 50 25	81·18	33·20	22 35	88·21
Villisca	427·41	12·18 p.m.	12 13 30	5 13 30	81·80	34·47	23 05	89·60
Red Oak	442·42	12·29	12 23 35	5 23 35	82·04	15·01	10 05	89·32
Pacific Jct. IA.	474·98	12·53	12 46 30	5 46 30	82·25	32·56	22 55	85·25
Oreapolis, Neb.	483·85	1·03	12 57 05	5 57 05	81·30	8·87	10 35	50·29
Ashland	510·26	1·34	1 25 00	6 25 00	79·52	26·41	27 55	56·76
Lincoln	534·57	1·53	1 45 55	6 45 55	79·02	24·31	20 55	69·73
Crete	554·67	2·10	2 06 15	7 06 15	78·08	20·10	20 20	59·31
Fairmont	587·92	2·33	2 28 42	7 28 42	78·62	33·25	22 27	88·86
Hastings	630·94	3·05	2 57 00	7 57 00	79·36	43·02	28 18	91·21
Holdrege	685·72	3·45	3 33 50	8 33 50	80·07	54·78	36 50	89·23
Oxford	708·73	4·03	3 50 10	8 50 10	80·21	23·01	16 20	84·53
McCook	762·86	4·42 CT	4 24 31					
		3·42 MT	3 24 31	9 24 31	81·08	54·13	34 21	94·55
Benkelman	814·06	4·20	3 57 15	9 57 15	81·78	51·20	32 44	93·85
Haigler	836·07	4·36	4 11 50	10 11 50	81·99	22·01	14 35	90·56
Wray, Colo.	852·47	4·49	4 22 45	10 22 45	82·13	16·40	10 55	90·14
Yuma	879·70	5·10	4 41 45	10 41 45	82·25	27·23	19 —	85·99
Akron	905·80	5·32	4 58 40	10 58 40	82·51	26·10	16 55	92·57
Brush	929·80	5·50	5 13 56	11 13 56	82·78	24·00	15 16	94·32
Keenesburg	980·45	6·28	5 45 50	11 45 50	83·34	50·65	31 54	95·27
Barr	999·44	6·42	5 57 40	11 57 40	83·56	18·99	11 50	96·29
Denver	1,017·23	7·00 p.m.	6 12 27	12 12 27	83·33	17·79	14 47	72·20

Diesel Engine Cycles and their History

THE history of the internal-combustion engine reveals the interesting fact that designers have ever been striving to follow along the same path of progress as that traversed by the steam engine. Thus the Lenoir gas engine, a model of which is to be found in the Science Museum at South Kensington, is described as being "not unlike a small horizontal steam engine." This engine, it may be remembered, was operated on the two-stroke cycle double-acting principle, but because its inventor did not realise the necessity of compressing the mixture of air and gas before ignition it was very inefficient, and the introduction of the engine working on the familiar Otto cycle in 1876 (the cycle may have been discovered by Beau de Rochas in 1862, but there is no record of any practical engine made by him) rendered the Lenoir engine obsolete. Thus the internal-combustion engineer was committed to the use of the four-stroke cycle, and when Daimler, in 1883, produced his petrol engine, he continued to use the four-stroke cycle. His engines were successfully employed for the propulsion of launches in 1887. All these engines were of the single-acting type. The fact that only one working stroke was obtained for every four strokes of the piston as compared with a working stroke for each stroke of the piston on the reciprocating steam engine, led many investigators to examine the possibility of the two-stroke cycle as applied to the internal-combustion engine, and the credit for the production of the first successful design must be given to Dugald Clerk, who in 1881 proposed the use of exhaust ports which were uncovered by the piston at the end of its stroke, the charge of air and gas, which was pumped into the cylinder through valves in the cylinder-head, serving to scavenge the cylinder as well as to fill it ready for the compression stroke.

Two-Stroke Principle

The two-stroke cycle engine, although it gave a greater power output for a given size of cylinder, had a considerably lower efficiency owing to the risk of air and gas escaping unburnt through the open exhaust ports or, alternatively, owing to the lower volumetric efficiency due to the dilution of the mixture with unscavenged exhaust. With the coming of the compression-ignition cycle the advantage of the two-stroke cycle was considerably enhanced, since air only is used as the scavenging medium and any excess of air, apart from the extra load it places on the scavenge pump, merely results in a cooling of the exhaust ports and, to a lesser extent, of the exhaust manifold. But the earlier diesel engines operated on the four-stroke cycle suffered from the fact that the average temperature in the cylinder was far too high for the materials which were then available, and designers could not lightly risk the increase in the average temperature which the adoption of the two-stroke cycle rendered inevitable. Thus, it was only with the great improvement in the technique of diesel engine construction, and in particular with the introduction of cast iron and steel which could safely withstand exposure to high temperature for long periods without appreciable deterioration, that the two-stroke engine became a commercial proposition. Today, thanks largely to the work of the metallurgist, the two-stroke cycle, even with engines of the highest power, is a thoroughly reliable proposition, and in view of the advantages of the greater power-weight ratio, the more even turning moment on the shaft and the higher mechanical efficiency due to the elimination of air and exhaust valves, it is being adopted to an ever-increasing extent.

It is curious that diesel railway traction should have begun with the application of a single-acting two-stroke engine, for of all forms that was inherently the most unsuitable for the form of drive (direct) adopted. But immediately afterwards the necessity of some form of transmission became evident, and thereafter four-stroke single-acting engines predominated, although lately the two-stroke principle has advanced with the advance in practicable rotational speeds.

Double-Acting Engines

The double-acting principle, which must be regarded as the next step in the history of the development of the internal-combustion engine, was adopted many years ago in conjunction with the two-stroke cycle, but only for very large gas engines in which the average cylinder temperature was relatively low. Even in these engines, however, the stuffing box, where the piston rod passed through the cylinder cover, was a source of considerable trouble. The higher temperatures inherent to the use of the diesel cycle rendered the adoption of the double-acting principle a matter of great difficulty with the diesel cycle, although a number of different designs of four-stroke cycle, double-acting engines were produced. But in addition to the difficulty with the stuffing box, there is also the difficulty of ensuring complete mixing of the fuel spray with the air in the combustion space, a difficulty which is not met with in the double-acting gas engine. However, with the gradual increase in our knowledge of the intricacies of the combustion process, satisfactory designs for the lower cylinder cover have been evolved, and the double-acting engine, even when employing the two-stroke cycle, is an undoubted success. Although double-acting engines have never been used in railway work, complete designs for a 1,650 b.h.p. locomotive were made some nine or ten years ago, and in an age more conducive to peaceful pursuits such a locomotive might have been built.

There yet remains one important feature of the reciprocating steam engine which has not so far been adopted on a commercial scale in internal-combustion engine practice, and that is the use of compounding. The idea has been tried experimentally, but it was the erosive action of the hot gases during transference from the high-pressure to the low-pressure cylinder which caused it to be abandoned. That was some time ago, and it might be urged that the progress which has since then been made, particularly in the production of heat-resisting steels, warrants the suggestion that the experiments could now be repeated with the promise of a certain measure of success.

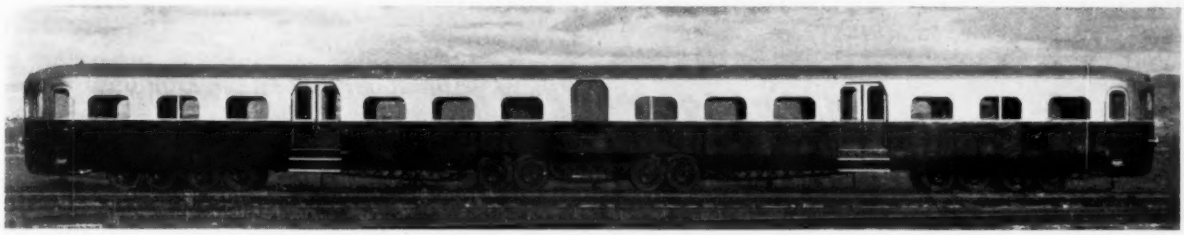
NORD DIESEL TRAIN WORKING.—The new 820-b.h.p. triple-car diesel-electric trains of the Nord (see issue of this Supplement for September 4, 1936) are proving so popular that overcrowding is being experienced on the fast Paris-Lille trips, and it is possible that multiple-unit working will be introduced, although diesel trains are run at such close intervals as 10.25 a.m. and 11.50 a.m. The point-to-point schedules have been accelerated to a maximum of 72·3 m.p.h. between Paris and Longueau, and the catering is good and cheap.

FRENCH RAILCAR SERVICES

RAILCAR services on the main-line systems of France have been greatly extended in the last four years.

In 1933, the number of cars was 34 and the distance run during the year was 1,367,000 miles. In 1934, 90 cars ran 5,406,000 miles and in 1935, 236 cars covered a distance of 12,987,000 miles. The number of railcars in 1936 rose to 354 and the distance run increased accordingly, but the total is not yet known. Orders for 170 new railcars were placed in 1936 and 161 in 1937.

A large increase in the number of railcar services formed a feature of the summer timetables in 1936. These included runs giving time-saving connections between main-line trains on the Alsace-Lorraine lines, direct railcar runs on the Est lines from Metz, Nancy, Rheims and Charleville to Paris, and services linking Nancy, Belfort and Mulhouse. The Etat instituted many shuttle services between stations on its main lines from Paris to Havre and Cherbourg, and the Nord added railcar facilities between Amiens and Rouen, Lille and Havre, Lille and Dunkerque and Lille and Boulogne. The P.L.M. introduced car runs between Marseilles and Nice, Vichy and Tours, Lyons and Morez, Lyons and Besançon, and Avignon and Marseilles. Cross-country runs from Bordeaux to Clermont-Ferrand and Lyons and from Le Mans to Vichy were scheduled by the P.O.-Midi.



400-b.h.p. 100-seater Michelin pneumatic-tyred single-unit railcar as being used on the Etat

In the winter timetables additional railcar runs were introduced by the Alsace-Lorraine lines between Strasbourg and Haguenau, Metz and Thionville, Strasbourg and Saint-Dié, Basle and Strasbourg, and between Colmar and Metzeval, and the Nord scheduled additional trips between Lille and Paris and between Douai and Valenciennes.

It is clear that railcars have become an integral part of the passenger transport organisation of the French railways. They can in many cases replace more costly steam trains on main lines, cross-country runs, and in local district connections, and they enable the railways to increase the frequency of passenger services and thus attract passengers who would otherwise travel by competing road cars. It has been found also that railcars are easily adaptable in cases where ocean liners call at ports and land insufficient passengers to justify the use of boat train expresses. Further, they can be run as specials when required for trips organised by private societies, and this type of traffic has increased greatly, as indicated on page 179 of the January 22 issue of this Supplement.

Trend Toward Standardisation

These developments are affecting the construction of railcars. The stage of experiment is passing, and since 1934 there has been a distinct trend toward standardisation. Orders for construction in series are becoming frequent. Modern designs include the possibility of multiple-unit working and there is a tendency to increase the power of the engines relative to the load. Railcars with bogie-mounted engines comprise more than 50 per cent. of the total of steel-tyred cars at the end of 1935.

Mechanical transmission in 1935 was most favoured in the bogie cars, but a few were fitted with electric transmission and hydraulic transmission was being tried. Constructors were then devoting greater attention to comfortable conditions for the passengers. For high-speed, the lead was still held by the Bugatti cars and by the diesel-electric Franco-Belge trains on the Nord.

Conditions of railcar maintenance have become more methodical. In general, supervision of the cars was entrusted to the constructor, the railway ensuring normal running shed maintenance as far as possible. But experiments are now being made in allowing the constructor to maintain the cars with payment on the basis of the kilometrage covered. The railways are also attempting to group railcars of the same type in depots at different centres. There were 53 such centres usually worked on the " star " system in existence at the end of 1935.

Effect on Traffic Receipts

Whether the increasing use of railcars is really tending to augment the gross passenger traffic receipts of the railways appears as yet uncertain. The railways are only now beginning to compile systematic statistics concerning the number of passengers travelling by cars and the effect on the gross passenger receipts. A government report on railway developments in 1935 made some references to this subject. It was pointed out that railway passenger traffic in that year was still under the influence of the trade depression and the competition of road cars, but that the introduction of railcars seemed to have checked the decline in passenger traffic and in many cases was responsible for a marked increase. The government report in general indicated that where railcars were simply substituted for steam trains in corresponding numbers, there was almost no increase in traffic, but that the decrease in operating costs represented a substantial profit.

If, however, the railcars were more numerous than the steam trains withdrawn there was an increase in receipts, because passengers were attracted by the increased facilities. The profit in such cases included the increased receipts plus the saving in operating costs. The most profitable results are seen in cross-country services where the railcar represents a great saving of time to passengers and creates new traffic. Generally speaking, the most favourable results in railcar working are obtained when at least two railcars replace each steam train withdrawn.

NOTES AND NEWS

Syrian Railcars.—The four railcars with CLM-Junkers engines and Mylius transmission acquired by the Damas-Hamah Railway in 1934-35 and described in the issue of this Supplement for January 25, 1935, have covered a total of 425,000 miles.

Reichsbahn Shunters.—A number of small diesel locotractors fitted with Ardelt mechanical transmission have been set to work recently on the German State Railway. The Ardelt transmission was described in the issue of this Supplement for February 23, 1936.

English Electric Diesels.—In the last issue (December) of the *English Electric Journal* is an informative article by Mr. G. T. Shoosmith recording the progress made by the English Electric Co. Ltd. in diesel traction, and illustrating and describing, *inter alia*, the three four-coach diesel-electric trains now being built for the Ceylon Government Railways.

Sulzer American Licence.—The American Locomotive Company has taken out a licence for the construction of heavy-duty two-stroke Sulzer engines, but not of the railway variety. These engines will be made at the Auburn works of the old McIntosh & Seymour company, which was purchased by Alco some years ago.

Danish Train Visits France.—One of the four *Lyntog* oil-electric streamlined trains set to work in 1935 has been released by the Danish State Railways, and is to be shown at the Paris Exhibition by the builder, A/S. Frichs. It journeyed all the way from Denmark to Paris last week under its own power, via Padborg, Hamburg, Aachen, Liége and St. Quentin.

New American Engine.—The Winton Engine Company, whose two-stroke engines are used extensively in the Burlington Zephyr, Union Pacific, and other streamlined diesel trains in the U.S.A., has put on the market a supercharged four-stroke range developing 100 b.h.p. per cylinder; the cylinders are 9·5 in. by 12·0 in. and the rotational speed 900 r.p.m.

Swedish Railcar.—The Varberg-Borås-Herrljunga Railway has put into service a double-engined diesel-electric railcar of 420 b.h.p. Each bogie carries one of the new two-stroke vee type Atlas oil engines running at 1,800 r.p.m.; an electric generator; and two traction motors. The engine and generator are arranged transversely. The electric transmission is on the Asea system.

Riviera Railcars.—The six twin-unit (one railcar and one trailer) diesel-electric sets operating between Toulon and St. Raphael on the Ch. de fer de la Provence have shown a maintenance cost of 1·9 fr. per train-km. (6·9d. per mile at the present rate of exchange) over a mileage per unit of 50,000 km. (31,000 miles). Each unit is powered by two 135 b.h.p. Berliet engines. The cars operate stopping trains over a route having frequent grades up to 1 in 37 and numerous curves of 100 m. (328 ft.) radius.

American Orders.—The Elgin, Joliet & Eastern Railroad has ordered six diesel-electric locomotives from the Electro-Motive Corporation, and the Michigan Limestone Company two 600-b.h.p. diesel-electric shunting locomotives from the American Locomotive Company. Two stainless-steel dining cars have been ordered from the E. G. Budd Manufacturing Company by the Chicago, Burlington & Quincy Railroad for insertion in the present seven-car 1,800-b.h.p. rakes of the Twin Cities Zephyr trains.

Roumanian Diesels.—The order for three oil engines and transmission sets which, as we recorded in the February 19 issue of this Supplement, has been placed with Ganz & Co., of Budapest, by the Malaxa car works, has been increased to six complete equipments, each set comprising a Ganz-Jendrassik 240-b.h.p. engine, a five-speed Ganz mechanical transmission, auxiliaries and air-conditioning equipment. These sets will be mounted in three twin-car close-coupled trains, and will be regulated by the Ganz electro-pneumatic remote control, as described in the issue of this Supplement for October 30, 1936.

Drewry Cars for South America.—Such a great deal of interest has been aroused by the railcar orders received lately by the Drewry Car Co. Ltd. from various Argentine railways, that it makes for clarification to say that the order for 99 diesel cars for the Buenos Ayres Great Southern and its associate, the Buenos Ayres Western Railway, includes the seven cars ordered about August last and recorded in the issue of this Supplement for October 2; that is, the original order was increased by 92 further cars plus one spare power bogie. In addition, the Drewry Car Company has in hand railcars for the Entre Rios and Argentine North Eastern Railways.

Nord-Ceinture Locomotive.—In February, 1933, a Sulzer-engined shunting locomotive of 800 b.h.p., was placed in service on the Paris Ceinture Railway, and after the fusion of the Ceinture it was transferred to the Nord system. Details of its performance on the Ceinture were given in the issue of this Supplement for May 17, 1935, but later data are now available. From going into service until the middle of 1936, this 1-Do-1 oil-electric locomotive put in 15,318 hours of work, and during this period the cost of maintenance and repairs was 85,287 fr., or about £1,120 at the present rate of exchange, corresponding to 5.55 fr. (17·5d.) per hour. The second general repair was given to the locomotive in September, 1936, after 15,733 hours of service, and the bearings—all those originally fitted to the engine—were found to be in good condition. The forged aluminium alloy pistons were found to be in a good state and were put back after examination. The top piston-ring grooves were found to be worn to a slight extent and were skimmed up; the remaining grooves needed no attention.

Polish Railcar News.—The intention of the Polish State Railways to use big double-bogie railcars powered by Saurer 12-cylinder 300-b.h.p. diesel engines has fallen through temporarily at least, apparently because stipulations that the engines should be made in Poland cannot be carried out. But Cegielski is busy with the manufacture of three railcars which are to be powered by supercharged engines of a Polish make, which will have a continuous output of 340 b.h.p. These cars will have electric transmission—two with the Gebus type and one with the Brown Boveri system. Engine and generator will be mounted on a subframe carried on the underframe through rubber blocks. These cars will run up to 100 km.p.h. (62 m.p.h.) and up to 80 km.p.h. (50 m.p.h.) when hauling 50 tons of trailers; the seating capacity of the car itself is to be about 52, and the weight is estimated at 56 tons. Cegielski is building also some 300-b.h.p. cars with two Saurer engines, as described in the issue of this Supplement for April 17, 1936, but with Voith hydraulic transmission in place of mechanical drive. Some new four-wheeled diesel cars and light trailers are being built by Lilpop, Rau & Loewenstein.